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SURGICAL ASSOCIATION NUMBER

Dedicated to the Memory
of
JOHN HUNTER
on
The Bicentenary of His Birth

INDEX NUMBER

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THE SURGICAL CLINICS
OF
NORTH AMERICA

Volume 8 Number 6

FOREWORD

After a lapse of almost two hundred years John Hunter's influence is still a living and pulsating force in scientific surgery. Because of the universal recognition of his influence it is only fitting, this year of 1928, the bicentennary of his birth, that the Pacific Coast Surgical Association[1] should dedicate this volume of The Surgical Clinics of North America to the memory of this great master.

Edgar L. Gilcreest,
Secretary.

San Francisco, California.

[1] This association is composed of surgeons residing in California, Oregon, Washington, and British Columbia.

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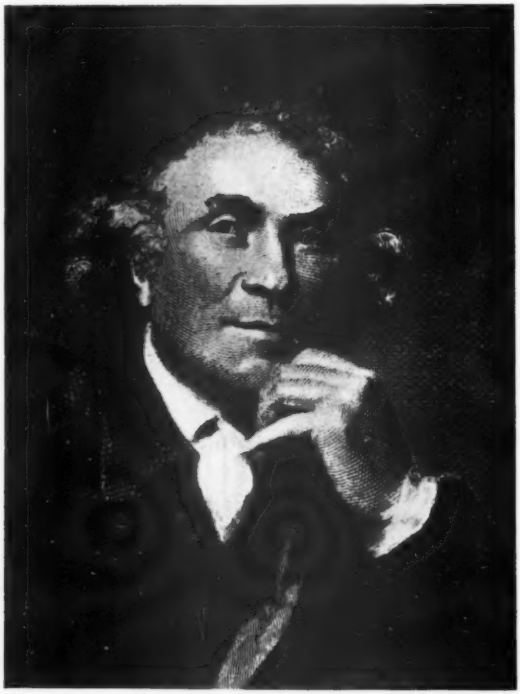
JOHN HUNTER
THE FOUNDER OF SCIENTIFIC SURGERY

IT is not my purpose to present to you a hero or an idealized picture; at the same time I believe that no great figure in all history has been more misunderstood than John Hunter. Instead it will be my endeavor to tell you something of the man himself, his discoveries, his achievements, his museum, and the ideals animating his whole life.

In order to appreciate his works let us first draw aside the curtain of history and try to visualize medicine two hundred years ago when John Hunter appeared on the scene which he was destined to dominate. At that time medicine was in its swaddling clothes. Very little accuracy had been attained either in this science or in natural history, or in any of their branches. In the colleges human anatomy and pathology were passed over in a few lectures, and comparative anatomy was in an embryonic state. The microscope had not taken its place as an instrument of precision in diagnosing healthy or morbid structure. Surgery, not entirely weaned from the barbers, and taught as an appendage to anatomy, was at its lowest ebb; medicine was, if possible, in a more precarious condition. England did not possess, in those days, even one medical college. There were in London a few private medical schools unworthy of the name. This, in a word, was the status when young Hunter arrived in the metropolis to begin his epochal labors and investigations which were to herald the dawn of a new day in surgical science.

Well may we pause for a moment to consider his ancestry, early life, and environment. His father, who was nearly seventy at the time of John's birth, was descended from an old and sturdy Scottish family in Ayrshire; his mother was the daughter of the treasurer of Glasgow. He was the youngest of



John Hunter

ten children, and perhaps it is not entirely his fault that he was a bit spoiled by a justly proud father, a loving mother, and doting brothers and sisters. It is not surprising, therefore, that this favorite son grew up impatient of restraint and given to idleness and disobedience. He was fond of games, somewhat rough

and boisterous; outspoken, impulsive, and generous; a good hater, but withal a staunch and loyal friend.

Although as a child he hated his school books he had an inquisitive mind. He was deeply interested in all the living things he saw; already collecting and comparing the many specimens he found on his frequent rambles in the woods. He said: "When I was a boy I wanted to know all about the clouds and the grasses, and why the leaves changed color in the autumn; I watched the ants, bees, birds, tadpoles, and caddisworms; I pestered people with questions about what nobody knew or cared anything about." And to these apparently useless pursuits John devoted a great part of his boyhood days.

When this ill-educated, unpolished, unkempt youth arrived in London in 1748, at the immature age of twenty, to begin his scientific career under the direction of his elder brother William, the foremost anatomist of his time, few, if any, would have been able to discover that hidden spark of genius, that indomitable spirit of determination that was to make his name immortal. It is impossible to estimate the value of the early influence of the elder on the younger brother. Although only ten years his senior William was more like a father than a brother. Beyond all doubt he was the architect of his younger brother's early success. John admits the debt he owes to William in a letter written in 1762 when he states, "I am very much obliged to you for your introduction of me; I think my name will live now as it is joined with yours."

History will ever recognize William Hunter as a great anatomist. It is conceded that his discovery of the lymphatic system, "after Harvey's discovery of the circulation, ranks as the greatest achievement in physiology of all time." He was a cultured and charming gentleman steeped in the best traditions of his profession. He moved in the society of royalty, litterateurs, and artists; was close to the king, being appointed by him Physician Extraordinary to the Queen, and numbered among his intimates Reynolds, Gainsborough, Hogarth, and Samuel Johnson. In sharp contrast to his distinguished brother, John cared little for this society. Surgery forever will be indebted to

William if only for the part he played in helping his young brother find himself, who, at the same time, lost himself in his deep love of science. One cannot help but wonder if William had not pointed out the way in anatomy in what other domain the supreme genius of John might have found expression.

It is interesting but sad that the subject, anatomy, which early fascinated and bound these two brothers in a beautiful tie of comradeship and lifework, was the force that actually separated and left them estranged until a partial reconciliation was effected at William's death-bed.

That work satisfies the soul is seen in the lives of both of these men. William writes in 1768 to Cullen, "My own affairs go on well. I am, I believe, one of the happiest of men." This great philosophic physician closed his beautiful and useful life with these words: "If I had enough strength to hold a pen I would write how easy and how pleasant a thing it is to die." Thus the curtain fell on the best teacher of anatomy of his time.

It should be remembered that John Hunter began his professional career subordinate to a celebrated brother. To the profession, for some time, he was known only as a good anatomist, his brother as a great anatomist. One readily appreciates that this was no small handicap to be overcome by the uncouth, sandy-haired, Scottish youth who left the farm and after eleven days' journey on horseback rode into London, there to begin a career of unparalleled industry, of scientific investigations and far-reaching discoveries which were to make him the most sought after surgeon of the great metropolis, and the first surgeon of all England.

After eleven strenuous years his health began to fail and, at the age of thirty-two, he left London to become an army surgeon. To this event we owe so many improvements in military surgery. In his remarks on gunshot wounds, for example, he lays down some fundamental principles, often overlooked today, and reveals the fact that he possessed that rare accomplishment —masterful inactivity. When he emphasized the importance of not enlarging wounds, but of frequently leaving them alone unless something necessary was to be done, he proved himself

a master surgeon. How often have we all seen infected wounds, which might have been clean ones, had they not been probed by a meddlesome surgeon. Hunter said: "This is common surgery and ought to be military surgery." The significance of this axiom gains more importance when one realizes that it was contrary at that time to the advice of such masters as Ambroise Paré and Baron Percy. An experience in three European wars has convinced me of the soundness of Hunter's doctrine uttered one hundred and sixty-five years ago.

Even at this period of Hunter's career his relationship with his contemporaries was not very cordial, as may be seen in a letter written to William from Bellisle in 1761 in which he wrote in part: "I have had the eyes of all the surgeons upon me, both on account of my supposed knowledge and method of treatment. My fellow Creatures of the Hospital are a damn'd disagreeable set. The two Heads are as unfit for their employment as the devil was to reign in Heaven."

Returning to London in 1763, after he had added to his great anatomic knowledge three valuable clinical years in military surgery, we find him settled in a home in Golden Square. "To the people around Golden Square," as Stephen Paget has written, "he was a zealous student of the human body, who might or might not restore you to health, but would certainly wish to anatomize you if he failed." But it would not be fair to have one think he was a recluse, at home only in a dissecting room with a cadaver and scalpel. No, he was not without his warmer side. It is said at this period "that he was a companionable man, associated in company, drank his bottle, told his story, and laughed with others."

He was now thirty-five years of age and beginning the most productive period of his life. We must no longer regard him as merely an anatomist or army surgeon, but as a comparative anatomist, biologist, naturalist, physiologist, pathologist, an eminent teacher and, above all, in the fullest sense of the word, a great surgeon.

Soon after he returned to London he organized his school of anatomy and started collecting and dissecting animals. He

was deeply interested in every living thing. His mind must have been, most of the time, simply teeming with innumerable great and comprehensive ideas and generalizations which he was ever striving to correlate and interpret as nature's methods and laws in his tireless efforts to relieve the sufferings of humanity.

He spared no expense or trouble to himself or his friends to obtain any kind of animal he desired. He was undoubtedly "one of the greatest collectors every known, and scoured the world through friends and messengers for the flora and fauna of all lands." As soon as he had accumulated ten guineas he would purchase some addition to his collection of animals. Not infrequently he borrowed from his friends. "Pray, George," he said to one of his good friends, a book seller, "have you any money in your pocket? Have you five guineas—if you have and will lend it to me, you shall go halves." "Halves in what?" inquired his friend. "Why halves in a magnificent tiger which is now dying in Castle Street." His friend lent the money and John got the tiger.

None of his friends did he call upon more often to obtain specimens than his former favorite pupil and life-long friend, Edward Jenner. The warm friendship which existed throughout all those years between them is shown in many letters. Jenner was sensitive to the greatness of his master and often spoke of his honesty of purpose and warmth of heart. He prized highly and carefully preserved all the letters from Hunter. Hunter's regard for Jenner can be epitomized in two lines of a letter to him in 1772: "I don't know anyone I would as soon write to as you. I do not know anybody I am so much obliged to." Then he gives him fatherly advice in the treatment of a patient about whom Jenner is solicitous. He laments that all the hedgehogs that Jenner had sent him had died and he desires more, adding, "I am hedgehogless."

The importance hedgehogs have assumed in Hunter's estimation in comparison with other affairs to which some men, in an emotional state, perhaps, are likely to give undue value, is emphasized in a letter of sound advice, condoling with Jenner, who has suffered a disappointment in love, when he

writes to him thus: "But let her go—never mind her, I shall employ you with hedgehogs."

That Hunter did not indulge in abstract theories and philosophical vagaries, but wrested from nature her innermost secrets, is evident in a letter written to Jenner who had offered a conjectural explanation of a phenomenon. Hunter writes on August 2, 1775: "But why think? Why not try the experiment upon a hedgehog and it will give you the solution." He was constantly trying to find ways to repay Jenner for all the trouble of collecting and sending him various specimens.

Among the many things to admire in Hunter is the fact that he never took life or himself too seriously, as witness the following note to Jenner written at the height of his fame, after he had become a frequent sufferer from angina pectoris:

January, 1789.

"Dear Jenner: I wish you joy; it never rains but it pours. Sooner than the brat should not be a Christian I will stand God-father, for I should be unhappy if the poor little thing should go to the devil because I would not stand God-father. I hope Mrs. Jenner is well and that you will begin to look grave now you are a father.

Yours sincerely,

J. Hunter."

And these lines in another letter: "What are you about? I have not heard of you and from you for this long time; you must be about some mischief that keeps you so quiet. Let me know what you are doing or else I will blow you and have you brought to town as a criminal."

At the age of forty-five he deemed it necessary to become a public lecturer for two reasons: first, because he was so often misquoted, and, second, because his discoveries were often referred to as the discoveries of others. After he became active in writing he soon saw the advantages of placing his thoughts on paper. He stated, "It resembles a tradesman taking stock; without which he never knows either what he possesses or in what he is deficient."

It is regrettable that John Hunter did not see the advantages

a classical education would have given him; his writings constantly reveal the handicap under which he labored all his life. This training would have given a finish to his work, but would not have changed an iota the mental processes which he used so effectively in his monumental investigations. However, his lack of a classical education afforded some of his contemporaries, particularly Jessé Foot, urged by jealousy, an opportunity to thrust in here and there a word of carping criticism, to which John replied: "Jessé Foot accuses me of not understanding the dead languages; but I could teach him that on the dead body which he never knew in any language, dead or living."

In Hunter's as in our day men were prone to write papers and books on subjects which they had not thoroughly mastered. Hunter's opinion for that sort of medical literature is well expressed in the following: A father brought his son to him as a pupil and inquired what books his boy should read. Hunter replied by taking them into his dissecting room and showing them the bodies and replying: "Sir, these are the books your son will learn under my direction, and others are fit for very little."

At this period we are seeing Hunter in the happiest time of his life, the zenith of his career, rapidly winning recognition. That his fame was not a glory reflected from his celebrated brother, but was established early on his independent merit and native ability, is attested by the fact that in 1767 he was elected a Fellow of the Royal Society which was three months before this honor was conferred upon William. That he was happy there can be no doubt. The joy of work and the realization of accomplishment appear in writings to his brother-in-law in reference to his work; he says: "It is nearly what I want; beyond which I have no ambition." Then, after mentioning his various experiments, he concludes: "While all these concurring circumstances go on, I must continue to be one of the happiest men living."

A great factor in the happiness of John Hunter was his fortunate choice of a wife. She was fourteen years his junior—a buoyant and charming woman who filled her drawing

room not infrequently with connoisseurs, raconteurs, and musicians. She added a cultural atmosphere to their home and her influence smoothed off the rough edges of Hunter's early uncouthness. She kept pace with him, and in the midst of his greatest successes she was something more than the mirror of his light—"she shone of herself." Many notable people were frequent guests in the Hunter home, among whom were Madame D'Arblay, Mrs. Montagu, and Lord Oxford. Mrs. Hunter wrote "My Mother Bids Me Bind My Hair," which was set to music by Haydn, and also the words for Haydn's "Creation." After Hunter's death she published a volume of poems and composed that remarkable epitaph for his memorial tablet in St. Martin's-in-the-Field. She retained her wit and beauty to the end, passing away in her seventy-ninth year.

One cannot help but have a feeling of sympathy for Mrs. Hunter as her famous husband's museum specimens began to overflow the London home and it became necessary to build a large house, at Earl's Court, where most of his biologic researches were conducted. There he kept, for purposes of study and experiment, the fishes, lizards, blackbirds, hedgehogs, and other animals sent him by Jenner; tamed pheasants and partridges, at least one eagle; toads, silkworms, and other creatures obtained from every quarter of the globe. Here it became necessary to add more and more rooms for his ever-increasing collection. The maintenance of this menage, together with his other establishment, required a retinue of fifty servants. It is little wonder, therefore, that his income allowed nothing for saving. This rambling old house must have appeared more like an old curiosity shop than a dwelling or even a scientific museum. Be that as it may, it was the apple of Master John's eye. Frank Buckland, the eminent naturalist, observed: "John Hunter had as great horror of feminine interference in his studio as have many philosophers of today." One had only to be familiar with the cloisters leading through a subterranean passage to be able clearly to visualize the indefatigable John wheeling in "a tidy sized cart or truck or dragging into his den anything from a giant's body to a good-sized whale." Many of his pre-

cious acquisitions found residence there without Mrs. Hunter's knowledge and, as adds the humorous Buckland, "I'll be bound to say she used occasionally to lead him a life, and kick up a row, if any preparation with an extra effluvium about it was left on the dissecting table."

Hunter's collection numbered nearly fourteen thousand specimens. These were explained in ten volumes of manuscripts, notes, drawings, and descriptions. "He dissected more than five hundred different species of animals, many of them more than once, and left records of three hundred and fifteen dissections." This vast museum, costing him over $350,000, was bought by the Government after his death for $75,000, and now forms the famous Hunterian Museum of the Royal College of Surgeons. I do not believe that the annals of medical history record any other man who either before or since Hunter's time has ever accomplished so much with his hands. For more than forty years he labored incessantly.

How it was possible for him to accomplish so much seems a mystery until one is acquainted with Hunter's personal habits. He is said to have arisen often at four o'clock and to have gone immediately to the dissecting room, where he worked until nine. Then a small breakfast; seeing patients in his home afterward; hospital rounds until four; a nap for one hour, and then to his lecture or to his museum, where he worked for hours. Not infrequently when his admiring, faithful, and loyal assistant, William Clift, left him at midnight he was trimming his lamp for further study. When a young student came down to London to enroll in his class, and called on him one afternoon, he gave him a few particulars concerning the work. He told him to return the next morning and he would "put him further in the way of things." When the student asked what time he should be there Hunter replied, "as soon after four as you can." To his surprise when he arrived he found Hunter "busily engaged in dissecting beetles."

It is possible in a paper of this length to enumerate merely a few of the outstanding achievements of this dynamic, versatile, and assiduous investigator and surgeon:

He *discovered*—

1. The lacrimal ducts.
2. Many features of the lymphatic system.
3. The exact descent of the testes in the fetus.
4. The part played by the olfactory nerve for the detection of smell, and the fifth cranial nerve for sensation.
5. How union of ruptured or severed tendons occur, having ruptured his tendo achillis when dancing. Then he performed tenotomies on dogs, thus laying the foundation of orthopedic surgery.
6. That digestion is arrested in hibernating animals, and drew the inference, therefore, that digestion is also arrested during the processes of inflammation in the human body. He pointed out that feeding and stuffing patients at this time was contraindicated. This great principle has often been overlooked, and it remained for two great American surgeons of our day, Murphy and Ochsner, to emphasize this again in the treatment of acute appendicitis.

He *studied and made valuable contributions on*—

1. The transplantation of teeth in the human subject and upon skin-grafting.
2. The mode of growth of the long bones.
3. The arterial supply of the gravid uterus.
4. The prevention of rabies, or hydrophobia, and was one of the first surgeons to teach that débridement of the wounded structure was indicated.
5. Shock, phlebitis, pyemia, and intussusception, inflammation, gunshot wounds, and the surgical diseases of the vascular system.
6. Head injuries, particularly on fractures of the skull and trephining.
7. Artificial feeding, demonstrating for the first time how this could be accomplished by means of a flexible tube passed into the stomach.
8. Artificial or forced methods of respiration, inventing an apparatus for such.

Space will permit no more than a mere mention of his observations on fetal smallpox, on the efficacy of mercury in the treatment of syphilis, on the differentiation between hard chancre and chancroid ulcer, on the development of birds in eggs, on superfetation, electric fishes, postmortem digestion of the stomach, on regeneration and transplantation of tissues, poisoning in animals, and on the habits of bees, hornets, and wasps, and on young bulls, leopards, and other ferocious animals.

His four masterpieces are—

"The Natural History of the Human Teeth."

"A Treatise on the Venereal Disease."

"Observations on Certain Parts of the Animal Œconomy."

"A Treatise on the Blood, Inflammation, and Gunshot Wounds."

His greatest innovation in surgery was the ligation and cure of a popliteal aneurysm by ligation of the femoral artery high up, in what is aptly called Hunter's canal, thereby introducing and establishing for all time a new principle in surgery which has saved "thousands of limbs and lives," and, as P. Assalini, an Italian surgeon, who saw it first performed said: "It excited the greatest wonder and awakened the attention of all surgeons of Europe." He had arrived at this principle by observation of and experimenting with the antlers of a deer in Richmond Park. Rohrer has stated that "this one feat of surgical daring, novel alike for its resourcefulness and originality, is in itself sufficient to give him undying fame."

Honors at this time began to pour in on Hunter from England, Scotland, and Ireland, and, indeed, from all parts of the scientific world, his years of ceaseless toil now bearing fruit in abundance. We must agree with Palmer who states "that of all who have attained to the highest rank as surgeon, no one ever rose so entirely by the pure force of superior talents as John Hunter or was less indebted than he was for his success to the good will and assistance of his contemporaries." Even up to the last Hunter worked as if he expected to live always. One of his last letters to Jenner reveals his unquenchable thirst for

knowledge as he requests him to send more hedgehogs for experimentation.

While he was progressive and enthusiastic in his ideas, his confrères were in a large measure conservative and stolid. Encouragement he never received. Some of his contemporaries were indifferent to his doctrines; others, incited by the venomous trio of prejudice, envy, and jealousy, were openly opposed to him. That he was thoroughly cognizant of all this was manifested when he said: "The few good things I have been able to do have been accomplished with the greatest difficulty and encountered the greatest opposition." Unquestionably "his doctrines were, necessarily, not those of his age; while lesser minds around him were still dim with the mists of the ignorance and dogmatism of times past, his lofty intellect was illumined by the dawn of a distant day." It is said he poked rather rough jokes at the pathologic dogmas held by some of his colleagues and gloried in the large group of physicians and students who followed him and not them. He must have been a bit of a pea-fowl, wearing "his laurels with an aggressive air."

Due to the increasing frequency of the spasmodic attacks of angina pectoris and to his lengthening years he was, nevertheless, compelled to endure the lash of professional jealousy. He realized that his life hung by a thread, and said: "My life is in the hands of any rascal who chooses to annoy and tease me." With many of his confrères, still enslaved by the traditions of the past, he was often impatient and even overbearing. Such a temperament, as may well be imagined, was not conducive to a particularly cordial relationship. Nothing is more certain to blind one's reason than jealousy. Many of Hunter's colleagues in London at that time could see no value in his discoveries or his marvelous collection. Envious of his superior intellect they grouped themselves and opposed all his efforts for the improvement of science.

An attack of angina pectoris was precipitated at last when one of his colleagues contradicted him at a Board Meeting of St. George Hospital while he was speaking in behalf of two students. His anger was instantly excited; he struggled for a moment to

inhibit his passion, tottered to an adjoining room, and fell dead. Such a death was not an unfitting climax. He died as he had lived, serving his fellowman. Thus ended the dramatic career of one of the greatest investigators, scientists, and surgeons of all time. But, as always, time has worked its revenge. Those contemporaries who criticised him most have joined the great caravan of fading names while his fame increases with the ages.

To appreciate fully the real inner man, to discern what were the fires of human kindness that burned within his breast, one has only to remember his loyalty to his friends, his fondness for animals, his self-sacrificing attention to and his utter frankness with his patients; his charities; his ever-ready response in assisting students or struggling practitioners—all these eloquently testify to the warmth and generous nature of this genius of whom our profession should always be proud.

As a great tree may be measured by the length of its shadows, so the greatness of John Hunter may be estimated by the famous surgeons who were his pupils and whom he developed. Well might he have been proud of such ardent followers as Cline, Abernethy, Astley Cooper, Travers, Green, Brodie, Lawrence—each of whom played their respective rôles in the development of English surgery. That Hunter's influence was an important factor in the development of early American surgery there can be no doubt.

The limits of time and space have permitted me an opportunity to give you only a panoramic view of the magnitude and scope of John Hunter's life-work. From the beginning of his scientific career to the end, that work was no less an undertaking than the study of the phenomena of life, in health and disease, throughout the whole range of organized beings. At all times he was intensely interested in the triumph of truth.

In the sense that he was constantly endeavoring to further knowledge he was what one would call today a propagandist. He introduced a new spirit—a new method of approach to surgical problems, pursuing a strictly inductive method of reasoning. He found surgery a handicraft still saturated with theories, magic, and mysticism, and carried it far into the realm of general

principles and law. "The surgery of the Middle Ages was a trade; Ambroise Paré and Jean Louis Petit converted it into an art and John Hunter elevated it to the rank of a science." Hunter's "permanent position in science is based upon the fact that he was the founder of experimental and surgical pathology and a pioneer in comparative physiology and experimental morphology." He has left to all succeeding generations a heritage of achievement and a legacy of wisdom and knowledge never equalled, nor, perhaps, will it ever be excelled. His influence upon scientific medicine, therefore, after a lapse of almost two hundred years is still tremendous and inestimable.

Such was the life of this all-embracing genius, the like of which the world produces scarcely once in many centuries. We readily agree with his apt remark to Maxwell Garthshore, who, finding him one morning very occupied in his museum, said: "John, you are always at work." To which the intrepid John replied: "I am, and when I am dead you will not soon meet another John Hunter."

His name will live forever, enshrined not only in the hearts of all surgeons, but in the hearts of all true scientists. He belongs to the Ages. Fortunate is it that Sir Joshua Reynolds has bequeathed us his portrait—the painting of an immortal by an immortal.

And even though time should dim the work of the painter there will remain the deathless tribute of the poet, his wife, who composed these beautiful verses as his epitaph:

"Here rests in awful silence, cold and still,
One whom no common spark of genius fired:
Whose reach of thought Nature alone could fill,
Whose deep research the love of Truth inspired.

Hunter! if years of toil and watchful care,
If the vast labors of a powerful mind
To soothe the ills humanity must share,
Deserve the grateful plaudits of mankind,—

Then be each human weakness buried here
Envy would raise to dim a name so bright:
Those specks which in the orb of day appear
Take nothing from his warm and welcome light."

CLINIC OF DR. ANDREW STEWART LOBINGIER

GOOD SAMARITAN HOSPITAL

PERICHOLECYSTIC ADHESIONS

IT would seem singular that in all the voluminous literature concerning disease of the gall-bladder and ducts, and especially the pathologic conditions associated with obstruction to the normal discharge of bile, so little importance has been ascribed to the obstructive influence of omental adhesions.

It is rare that a seriously diseased gall-bladder will be found without distortion from bands of omental attachment which are the result of a pericholecystic inflammation. These bands may occasionally arise from an extrinsic inflammation due to appendicitis or a septic kidney followed by peritonitis localized in the right side. But almost invariably there is evidence of a previous septic hepatitis and cholecystitis wherein the gastrohepatic and great omentum have formed adhesions to the gall-bladder, duodenum, and under surface of the liver, frequently drawing the hepatic flexure and first portion of the transverse colon far from the zone of their normal excursion. We so frequently see the gall-bladder partly or wholly covered in with such adhesions, weighed down by a dragging transverse colon from the omental attachment, that these adhesions have assumed, in our mind, a place of major importance in all operations in the right hypochondrium. Moreover, we are strongly of the opinion that in at least 30 per cent. of these cases the need of a cholecystectomy will not appear when the gall-bladder is freed and the omental attachments are broken up. When the liver is thin edged, with a soft pliable feel and a normal color, and the gall-bladder wall is found to be thin and blue, there can be no justification for further operative interference after the adhesions are broken

up and the raw omental areas carefully turned in. Far too many such gall-bladders have been removed. There is certainly no reason for imposing the hazard of a cholecystectomy with so little pathology in the liver and gall-bladder to justify it.

A history of acute appendicitis or of pyonephrosis should lead one to suspect a possible extension to neighboring viscera. Cases are being reported in the literature of obstructive jaun-

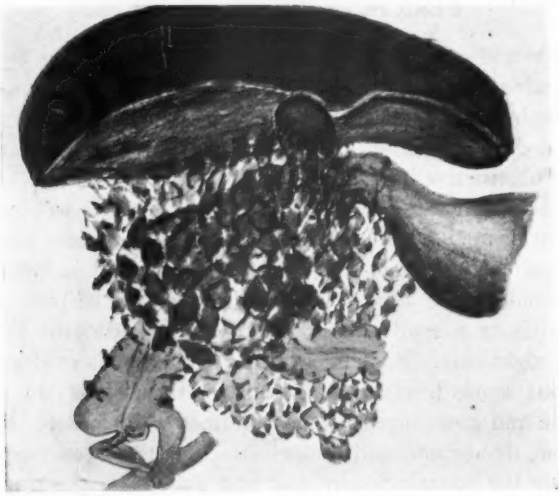


Fig. 450.—Pericholecystic adhesions involving gall-bladder, duodenum, and hepatic flexure. Kinks in terminal ileum and appendix.

dice resulting from deforming adhesions arising from appendiceal or renal infections while these infections were still active. As soon as the septic focus was drained or removed the jaundice subsided.

We may find in many cases of adhesions about the gall-bladder a persisting hepatitis with edema and granular liver, and associated with this condition a definite chronic cholecystitis with thickening of the gall-bladder wall and a chronic inflammatory edema of the pancreas. In such a case to tie off the

cystic duct and remove the gall-bladder without draining the liver through the cystic duct is manifestly irrational surgery. This pathology may persist for years without a competent diagnosis being reached or the patient relieved of the distressing symptom-complex, marked chiefly by those digestive disturbances characterized by nausea, gas distention, and colonic pains. These patients spend years in sanatoriums under treatment for indigestion and colitis, and drift eventually into the absurd tyrannies of newspaper "dietitians."

I can recall no other abdominal pathology which contributes so much to the sum total of human wretchedness as these undiagnosed and improperly treated adhesions. It would appear that they remain unfamiliar to internists and many surgeons chiefly because they are not routinely looked for. It is so easy to think of cholecystitis and the various forms of colitis and to be governed in reaching this conclusion by the readings of a radiographic gastro-intestinal group of films or of cholecystography. The revelations of the living pathology at the operating table show with graphic emphasis how misleading laboratory findings of all kinds may be in these cases, compared with the value of the clinical evidences revealed by a careful and critical bedside analysis. We have been led reluctantly to attach very little importance to the negative evidence found in the radiographic film in pericholecystic adhesions. In the majority of instances we go through with the study as a matter of routine, but it rarely helps us.

Pain in the right side near the colon flexure is a cardinal and constant symptom.

Pylorospasm from constriction or tugging at the first portion of the duodenum is a definite and frequent symptom.

Bloating, a sense of fulness after even a small meal, is almost invariably present. Tenderness over Robson's point is constant in 85 per cent. of our cases.

Constipation, a coated tongue, and aversion for fatty foods are characteristic and important factors in the complex.

The treatment may be simple—to free the adhesions and turn in the raw surfaces. But how very extensive and time con-

suming this procedure may be is obvious to anyone who has seen how extensive and complicated these adhesions often are.

The appendix may have been removed on a previous occasion. If so, it is nevertheless important to examine the cecum and the terminal ileum. Often very obstructive kinks and adhesions may be found there. The region of the ileocecal valve cannot be ignored even when we are thinking intensely on what we shall find higher up about the gall-bladder.

The ascending colon, the hepatic flexure, and the first third of the transverse colon merit an equally critical inquiry. Rarely are the flexure and the transverse colon not involved in adhesions about the gall-bladder.

After all adhesions about the gall-bladder have been freed and the duodenum and cystic duct mobilized, we have finally to determine by the condition of the liver and pancreas, and the freedom with which the gall-bladder empties and the degree of normality of its wall, whether we shall leave it or remove the fundus and drain the liver through the cystic duct, or do a complete cholecystectomy.

The surgeon who has proved himself qualified to make a correct diagnosis in this complicated pathology has learned well how to competently deal with the problems which will confront him in the operating room.

CLINIC OF DRS. W. I. TERRY, H. H. SEARLS, AND R. J. MILLZNER

FROM THE DEPARTMENT OF SURGERY OF THE UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL

PRESERVATION OF THE PARATHYROIDS AND RECURRENT NERVES BY A MODIFIED THYROIDECTOMY

IN man four parathyroids are usually present, although the number may occasionally be increased or decreased. Accessory fragments of parathyroid tissue are frequently present, and may be found anywhere in the region of the thyroid or trachea.

The superior parathyroids are usually described as lying on the posterior surface of the thyroid near the junction of the upper and middle thirds of the lobes. This corresponds approximately to the level of the lower border of the cricoid cartilage. The inferior parathyroids usually lie on the posterior surface of the thyroid near the postero-inferior margin of the lateral lobes. The normal location of the parathyroids is in the loose connective tissue immediately outside the thyroid capsule. Occasionally they lie in a split layer of thyroid capsule, but it is always possible to lift them by blunt dissection and demonstrate their entire lack of connection with the thyroid gland tissue.

Variations from this typical arrangement are quite common. Studies in this clinic, based on 612 thyroidectomies and 25 dissections of cadavers, show that in approximately 30 per cent. of cases one or more parathyroids are present on the lateral or anterior instead of the posterior capsule. Microscopic identification of parathyroid glands is so accurate and so positive as to exclude all doubt concerning the character of the tissue examined. In our series of abnormally located parathyroids the inferior outnumbered the superior approximately two to one.

We have found no correlation between the size or type of goiter and abnormal location of the parathyroids.

The parathyroids have a definite blood-supply which aids greatly in their recognition and identification. They always lie in close relation to the superior and inferior thyroid arteries and their larger anastomotic branches. The superior parathyroid on each side receives its blood-supply from a superior parathyroid artery which arises as a short unbranched vessel from the lower portion of the superior thyroid artery or from one of the larger anastomotic branches between the superior and inferior thyroid arteries. Each inferior parathyroid is supplied by an inferior parathyroid artery derived from the inferior thyroid artery.

The most important function of the parathyroid glands has to do with the control of the concentration of calcium in the blood. Collip has been able to adjust the level of blood calcium at will by the administration of the active principle of the parathyroid glands—a substance which he has isolated and named parathormone. In parathyroidectomized animals a normal blood calcium, a hypocalcemia, or a hypercalcemia was effected at will by using varying amounts of the hormone, the blood calcium varying directly with the amount of parathormone administered.

Both hyper- and hypo-calcemia cause alarming symptoms, but it is the latter condition which is of chief interest to the thyroid surgeon. As the blood calcium drops below the normal content the clinical picture progresses from the mild to the advanced forms of tetany. The mild forms are characterized by hyperexcitability of the peripheral motor nerves (best illustrated by the Chvostek, Erb, and Trousseau signs) and a feeling of numbness and tingling in the extremities.

In the more severe cases muscle twitchings are noted, while in the advanced condition there are characteristic tetanic convulsions with flexion of the fingers on the metacarpophalangeal joints and marked adduction of the thumbs (the so-called obstetric hand). The foot is often similarly affected.

The Chvostek sign is elicited by tapping the seventh nerve where it emerges from the parotid gland, thereby demonstrating

contractions of the facial muscles on that side. It is a sign of hyperexcitability of the seventh nerve and may frequently be found in apparently normal individuals.

Trousseau's sign is obtained by circular compression of the arm at the level of the elbow. After several minutes the obstetrical hand appears.

Erb's sign is hyperexcitability of motor nerves to galvanism. It is an accurate and delicate test for tetany. The Trousseau is also accurate, but less delicate. The Chvostek is quite delicate, but not so accurate.

Patients suffering from hypoparathyroid tetany obtain relief when the blood calcium is restored to its proper level. This may be done in the mild cases by simple administration of calcium lactate, carbonate or bromide by mouth (1 gm. t. i. d.) or the chlorid intravenously (10 c.c. of the 5 per cent. solution once or twice daily). In the more severe cases parathormone (25 to 100 units daily) controls the symptoms readily. Frequent blood-calcium determinations should be done to prevent the development of hypercalcemia.

Successful parathyroid transplants in the human have been occasionally reported in the literature. Halsted succeeded in transplanting them in animals.

Because of the occurrence of parathyroids on the lateral and anterior capsules of the thyroid gland (as noted above) many of these glandules are removed in the standard operation of subtotal thyroidectomy in which the surgeon plans to leave only the posterior portion of the capsule together with a small amount of thyroid tissue. Lahey observed the occurrence of parathyroids in removed tissue in operating for goiter and outlined a technic for their reimplantation at the table. Noting Lahey's findings, a more careful examination of our material revealed a startling frequency of parathyroids in removed specimens of thyroid glands. In such instances the parathyroids generally lay on the lateral or anterior capsule of the thyroid in close association with a large vessel or near a branch of the superior thyroid artery at the very tip of the upper pole.

By modifying the resection so as to preserve lateral as well

as posterior capsule (Fig. 451) it has been found possible to save many parathyroids of the patients. A small amount of each superior pole is also left to further aid in their preservation. It is interesting to note that Dr. Halsted advised many years ago the preservation of somewhat similar portions of the thyroid gland and capsule in order to save the blood-supply to the parathyroids. He had observed clinically fewer cases of tetany when these procedures were employed. Since these modifications have been effected, parathyroids have only rarely been found in the removed tissue. Careful examination of the thyroid cap-

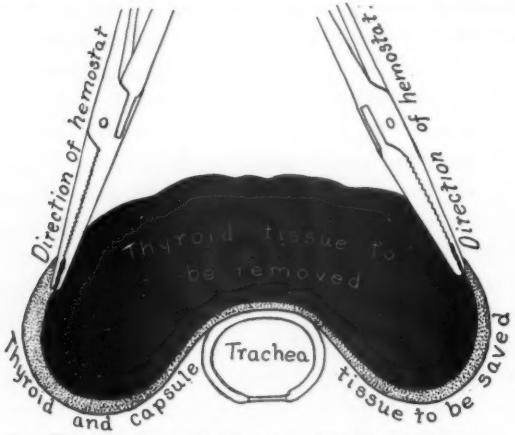


Fig. 451.—Schematic plan of modified thyroidectomy.

sule during operation may also reveal the characteristic glandules and special measures can then be instituted for their protection. These changes also serve as additional protection to the recurrent laryngeal nerves.

To be of clinical value the recognition of abnormally located parathyroids must be gained in the operating room rather than in the pathologic laboratory. Nearly all of these abnormally placed parathyroids are saved by the above described modified technic. Those that are removed may be recognized while the specimen is still sterile and reimplanted at once.

The technic of search for removed parathyroids is quite

simple. The specimen may be examined by the operator or one of his assistants. The relation of the parathyroids to the branches of the superior and inferior thyroid arteries is of great assistance since it is usually only necessary to follow along these vessels and their larger branches.

The parathyroids are oval, bean-shaped, or flattened bodies. They vary from 2 to 8 mm. in length, 2 to 4 mm. in width, and 1 to 3 mm. in thickness. They tend to be rather soft and inelastic. The color varies from yellow or yellowish brown to a dark reddish brown, depending on the degree of vascularity and the amount of fat present beneath the parathyroid capsule. In fixed material they approach more of a chocolate tint. In the fresh they may be somewhat translucent, especially if small. The presence of the relatively large parathyroid artery entering the hilum and the location in the loose connective tissue just outside the thyroid capsule usually make identification simple.

The appearance and relations of the parathyroids are sufficiently characterized to identify them in most cases. They must, however, be differentiated from other nodules which may lie in the same locations and closely simulate them. Fragments of thyroid tissue cause the greatest difficulty. These fragments may be small adenomas or small detached pieces of thyroid gland proper. Thyroid tissue is pinker and frequently contains recognizable colloid. It is also much firmer and more elastic. In nearly every case it is possible to demonstrate its connection with the thyroid gland and it cannot be separated from the thyroid capsule without tearing this connection. A definite artery is never seen.

Small masses of fat may simulate parathyroids, but are not encapsulated, are softer, and have characteristic color. They also lack a definite artery. Small lymph-nodes are frequently confused with parathyroids. They may even show a distinct hilar artery. (This is especially prominent in hemolymph-nodes.) They may be differentiated by the grayer color (grayish red in hemolymph-nodes) and the much firmer consistency. They are usually more opaque.

Any parathyroids found on the removed specimen are at

once dissected free from the gland and placed in warm sterile Ringer's solution. During the closure of the wound a small pocket is formed in the belly of one of the sternomastoid muscles by blunt dissection. The parathyroid is inserted in this pocket and the edges approximated by interrupted sutures of No. 000 catgut.

Conclusions.—1. The parathyroids play a vital part in calcium metabolism in the body. Removal of one or more of them may lead to the development of very grave symptoms.

2. The frequent occurrence of parathyroids on the lateral and anterior capsule of the thyroid has been demonstrated.

3. A simple modification of the standard operation of subtotal thyroidectomy is offered in order to preserve any parathyroids which may lie on the lateral capsules, and to act as an additional safeguard to the recurrent laryngeal nerves.

4. Specimens should be examined while still sterile and any parathyroid tissue found reimplanted.

CLINIC OF DR. EMMET RIXFORD

STANFORD HOSPITAL

LESIONS PRODUCED BY FORCED ABDUCTION OF THE SHOULDER*

WHEN the limit of motion, in any direction, of a diarthrodial joint is reached the ligamentous apparatus of the side away from which the rotation takes place (side of the convexity) becomes taut, *i. e.*, it furnishes tensile resistance to further motion in that direction.

Such tensile stress, developed as movement ceases, under the laws of mechanics must be balanced by corresponding compressive stress which, of course, is furnished by contact of the bony surfaces of the joint.

If severe enough force is applied after the limit of normal motion is reached, this balance is overcome and something must give way: ligaments are torn or avulsed from their bony insertions producing sprain or, if carried further, dislocation; or the bone may give way, yielding to tension (common) or to compression (relatively rare).

Abduction at the shoulder-joint, with which we are now dealing, is limited by tension of the inferior portions of the capsule balanced by pressure of the head of the humerus against the glenoid. At the same time the greater tuberosity of the humerus comes into contact with the upper portion of the cotyloid fibrocartilage (labrum glenoidale) which separates the tuberosity from the bony edge of the glenoid and which furnishes therefore an elastic cushion lessening the suddenness or shock of the impact, but which is easily crushed. Pure abduction is thus limited at about 90 degrees (the horizontal position). On the

* Delivered at Peter Bent Brigham Hospital, Boston, April 20, 1927.

other hand, if the arm be raised in the sagittal plane—a motion which I like to call extension—the greater tuberosity traverses an arc more or less parallel to the posterior edge of the glenoid, the capsule at first becoming relaxed because of unwinding of the spiral direction of its fibers seen in the "anatomical" position, also because of its laxity becomes tense and arrests elevation only after a rotation of 150 to 170 degrees is reached.

If at any elevation of the humerus in the sagittal plane abduction be made to its limit the greater tuberosity impinges on the upper posterior edge of the glenoid, limiting at once both the abduction and extension.

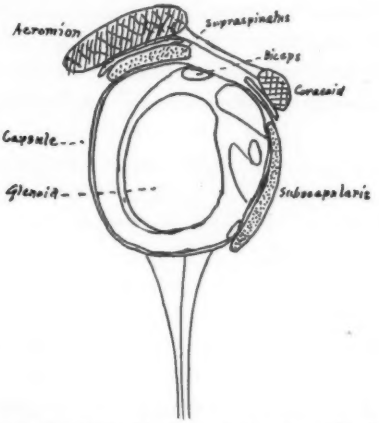


Fig. 452.—Capsular aspect of interior of shoulder-joint (after Testut).

Most abduction injuries of the shoulder are gotten by falls forward, the hand and arm being thrown more or less forward in protection, the arm being in pronation. It follows, then, that the greater tuberosity is in its more forward positions resulting from the internal rotation. If now abduction occurs with a greater or less degree of elevation in the sagittal plane, the greater tuberosity strikes the edge of the glenoid somewhere behind its narrow upper portion.

If the scapula is fixed by tension of muscle and aponeurosis (rhomboid and lower part of trapezius with their aponeuroses)

balanced by compressive stress transmitted along the clavicle, and severe abducting force continues, ligament or bone must give way. The principal lesions resulting from this single mechanism are briefly described below.

The distribution of the stresses of tension and compression in the structures about the shoulder-joint when this joint is subjected to violent abduction may be gathered from the following diagram (Fig. 453) where compression is indicated by a plus sign (+) and tension by a minus sign (−). Of course the whole humerus and scapula are under stress, tensile on one side and

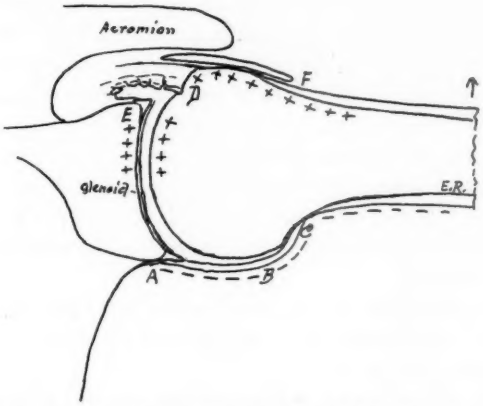


Fig. 453.—Stresses at shoulder produced by forced abduction: + = compression stress, − = tensile.

compressive on the other, and throughout the material of their interiors with a line somewhere in the interior where the two forces balance and the stress is zero. A diagram represents a simplification of the actual conditions, for it goes without saying that one cannot in a diagram set forth all the stresses present even in any momentary phase of such a mobile mechanism. Moreover, the distribution of forces varies with every variation in position of the elements of the joint.

The capsular ligament most frequently gives way at its lower portion, *B*, where tension is a maximum because of the curva-

ture of the head of the humerus, and besides at this point the capsule is thinner. Sometimes the capsule is pulled away from the bone at *C* or *A* (avulsion).

LESIONS RESULTING FROM TENSION

1. If the abducting force ceases with a slight tear of the capsule the resulting lesion is a *sprain.*

2. If, however, the force continues and the capsule gives way, the articular surface of the humerus is lifted off the glenoid by leverage about the point of contact of the greater tuberosity with the upper edge of the glenoid as a fulcrum. The head of the humerus is forced out through the rent in the capsule, the lateral edges of which tend to make a straight line from *A* to *C*. If now even a slight blow be struck on the dorsum of the shaft of the humerus or if longitudinal thrust occurs, as in falls on the hand, or if simple abduction be continued until the dorsum of the humerus beyond the tuberosity impinges on the acromion or the coraco-acromial ligament, the acromion or the ligament furnishes a fulcrum and the head of the humerus is lifted off the glenoid and forced out through the rent in the capsule and *dislocation* results.

It is evident that tensile stress of the bone is a maximum at the points of attachment of the ligament—on the humerus at *C*, on the scapula at *A*.

3. The humerus may yield to tensile stress in a fissure which starts at *C* on the distal side of the attachment of the capsule resulting in the common *fracture of the surgical neck of the humerus* (Fig. 454).

4. The scapula may yield to tensile stress at a corresponding point a little proximal to the point of attachment of the ligament at *A*, resulting in *fracture* more or less complete *of the neck of the scapula.*

LESIONS RESULTING FROM COMPRESSION

If the ligaments and their attachments are strong and the bone tough, the bone may give way to compressive stress.

5. In young subjects the compressive stress applied by the capsule to the lower surface of the head of the humerus may

develop shearing stress to which the bone may give way along the epiphyseal line resulting in *epiphyseal separation.*

6. At *D,* by which the greater tuberosity is sheared off and displaced downward along the shaft of the humerus. The periosteum is not torn at the lower edge of the tuberosity, but is stripped up from the shaft of the humerus—a matter for consideration in therapy.

Sometimes the shearing off of the greater tuberosity is followed by dislocation (Fig. 454), when the fracture of the tuberosity is commonly looked upon as a complication of the dislocation. It may also precede fracture of the surgical neck.

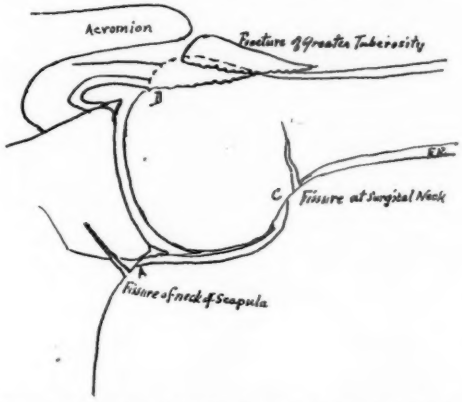


Fig. 454.—Fissure at neck of scapula; fissure at surgical neck of humerus; fracture of greater tuberosity.

7. The upper edge of the glenoid may be damaged by the impact of the greater tuberosity, and give way in a crushing fracture (rare).

8. Again in young subjects the humerus, resisting by its toughness fracture by tension, may give way on the opposite side by buckling under the compressive stress at *F,* producing thereby a *buckling fracture of the surgical neck* which bears the same relation to the ordinary fracture of the surgical neck as does the buckling fracture of the radius to Colles' fracture (Fig. 455).

Partial fracture is perhaps a better basis for estimation of the direction and nature of the forces producing a fracture than complete fracture with its secondary displacements.

The *x*-ray not infrequently discloses fissures which cannot be discovered by ordinary clinical examination. The writer has observed cases of partial chiseling off of the greater tuberosity, a fissure entering the humerus at *D* (Fig. 454), fissure of the neck of the scapula entering the bone 1 or 2 cm. at *A;* fissure entering the surgical neck of the humerus at *C*, and buckling of the bone in childhood at *F*. It is evident that such fissures can only be produced by tension, and the buckling fracture by compression as indicated.

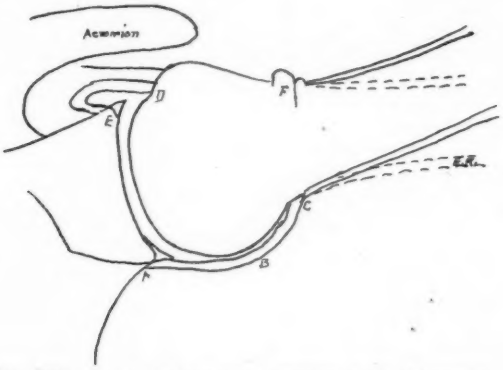


Fig. 455.—Buckling fracture at surgical neck of humerus.

The law of balance of tensile and compressive stress when movement is arrested is evident enough in such simple movements as abduction as discussed above, or in simple flexion and extension, for example, of the elbow or knee, but the law is really general and applies just as well in the more complicated motions of axial rotation of such joints as the hip and shoulder. Here tensile stress is developed by the shortening of the elements of the capsule by virtue of their being thrown into oblique or spiral direction. This tensile stress is, in turn, balanced by compression of the head of the femur or humerus against the acetabulum or glenoid respectively at the moment when motion is arrested.

The lesions produced by forced motion, as in abduction, may, of course, be complicated by additional compression and tensile stress produced by axial rotation which would modify the location and direction of tension fractures and tears in the ligamentous apparatus.

CLINIC OF DR. REXWALD BROWN

COTTAGE HOSPITAL, SANTA BARBARA, CALIFORNIA

TUBAL TWIN PREGNANCY

THIS young married woman, aged thirty-two, has an acute abdomen. She is a Hungarian, and as neither she nor her family speak good English it is difficult to get a history. Doctors Henderson and Moffat who saw the patient first yesterday endeavored then to get her into the hospital. They made a tentative diagnosis of ruptured ectopic gestation from the acute violent onset of pelvic pain three weeks previously, the daily continuance of severe crampy pains, and a mass in the pelvis. During last night the picture changed to that of an acute abdomen—rigid, tender, board-like—vomiting, and now a temperature of 103° F. She has just come into the hospital, and we shall open the abdomen at once. Perhaps the trouble may not be ectopic, but of infectious origin. However, the patient's condition does not warrant further study. We are dealing with an acute surgical abdomen which is sufficient indication for exploration.

We find that the pelvis is filled with an enormous mass of clotted blood reaching well above the pelvic brim. The uterus, tubes, and ovaries are embedded in the organizing blood-clot. The omentum thickened by the infiltrating blood is spread over the blood mass and adherent to all parts of the pelvic walls and organs. On freeing the adhesions and turning up the omentum we are surprised to find in the center of the blood-clot two fetuses. Each is completely formed, of an age apparently two months, and unattached to a placenta. The fetuses are removed and will be preserved.

Both fallopian tubes are now removed and the abdomen will

be closed. Let us examine the tubes. The right one shows marked inflammation, but no evidences of a pregnancy having been present. The left tube is highly inflamed, greatly enlarged, and thickened near the fimbriated end. The mucosal surface suggests that the ectopic pregnancy was pocketed near the fimbriæ and that a tubal abortion, fetuses, membranes, and placenta, had occurred through the fimbriated end.

There are not many records of tubal twin pregnancies. Arey, in 1923, since which time there is little literature on the subject, wrote that there were only 30 positively authenticated cases. Arey's studies in embryology led him, however, to state that tubal twins occur fifteen times more commonly than the uterine ratio. It is my conviction that scores of tubal twinning are not recognized at operation. This is explainable because early ruptures before the twins are grossly demonstrable are fairly common, and because in many hospitals the correlation between the surgical and pathologic departments is not sufficiently intimate to insure careful examination of removed tubes and clots.

It is very generally accepted that the pathologic changes secondary to inflammation in a fallopian tube are responsible for the lodgment of the impregnated ovum and its subsequent growth in the walls of the tube. These pathologic changes are very slight, a mere residue in the lumen of the tube of an infection which has nearly or completely healed. These changes act, however, as a definite obstruction to the passage of the enlarging fertilized ovum. The fertilizing spermatozoön because of its small size and flagellated extremity had been able to pass the pathologic barriers.

The very complete knowledge of the course of tubal inflammation from the onset of the infective process to final healing explains by deduction the sterile period in both multiparæ and nulliparæ. It is a well-known clinical observation that when tubal pregnancy occurs either to the woman who has had children, or who though married is yet childless, there is usually an average interval of five to eight years since the last pregnancy or since marriage in the respective cases. This is the period of time that generally elapses before the lumen of the fallopian tube becomes

patent after those infections of the tube which terminate in recovery expend their forces. In multiparæ the infections are largely those of streptococcic or staphylococcic strains which enter through the traumata incident to childbirth or abortion. In nulliparæ the Neisserian organism is mainly responsible.

The pathologic basis for tubal gestation is very largely also responsible for twinning in the tube (Stockard and Mall). This applies to twins from a single ovum, homologous, or identical twins. Experiments and observations over many years in the embryologic field have yielded evidence which has permitted the formulation of a theory which though not yet proved is yet an interesting scientific approach to the understanding of the baffling problems of twins and various types of monstrosities.

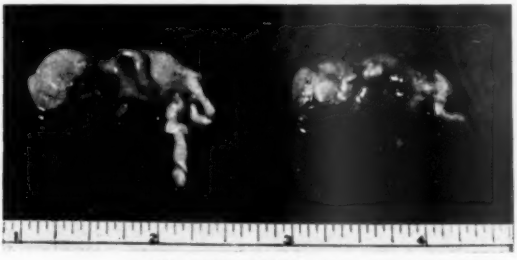


Fig. 456.—Tubal twins.

The theory is that there are critical moments in the developmental phases of the fecundated ovum during which are determined the origin of normal or abnormal beings, organs, or parts. In this conception homologous twins are abnormalities.

These critical moments are due not to hereditary pushes, but to environmental factors outside the egg. Normal or reduced oxygen supplies are all important. If oxygen environment be wholly adequate normality is assured; whereas if there be retarded oxidation at one of the numerous stages of embryonic growth there is a developmental arrest or inhibition.

To explain the origin of twins it is assumed that at the moment when a single primitive streak or embryonic axis is about to assert its dominance to evolve a single individual, as is ap-

parently nature's purpose in human evolution, there is a decreased oxygen supply which slows the normal developmental rate. The single primitive streak loses its position of advantage, and there arises another (or more) primitive streak which competes with the other on equal terms. If the streaks be separated widely as they develop twins are the result.

The residuum of pathology which delays the passage of the fertilized ovum through the tube and prevents implantation normally in the uterine mucosa also interferes with adequate oxygen supply to the growing egg. The combination of delay, continued growth, and deficient oxygen relations occurs not infrequently at the critical moment which favors twinning.*

* The patient made an uninterrupted recovery and is now in good health.

IMPACTED STONE IN LOWER URETER. REMOVED BY INCISION THROUGH POSTERIOR BLADDER WALL

THIS patient is seventy years of age. She was referred to me a short time ago by Dr. W. D. Sansum for diagnosis of recurrent severe attacks of pain in the left lower quadrant of the abdomen. These pains are said to have been agonizing at varying intervals for five years past and were preceded over a period of fifteen years by severe aches and colic in the left lumbar region. Dr. Sansum has furnished us with his diagnosis of the patient's concurrent maladies, which are hypertension, chronic nephritis, mitral regurgitation, chronic osteo-arthritis, colitis, anemia, pyuria, varicose veins of the leg, and malnutrition—not an encouraging picture. The patient states that eight years ago a doctor took pictures of her left kidney and told her she had stones, for which she was given medicine.

My associate, Dr. Irving Wills, has cystoscoped this elderly woman, and could hardly get a catheter past the left ureteral orifice. He did succeed in passing a filiform, whale-bone bougie to a point about 3 cm. from the orifice, where it met an obstruction. The filiform finally passed this obstruction and there was a gush of cloudy urine. *x*-Ray pictures revealed stones in the kidney and a large bullet-shaped stone in the lower ureter close to or in the walls of the bladder. Dr. Wills has interpreted the joint cystoscopic ureteral and *x*-ray findings as a stricture in the terminal ureter in the wall of the bladder and an impacted stone about 3 cm. above the ureteral orifice (Fig. 457, *a*).

Since these examinations were made I have seen the patient in a typical attack. It was truly agonizing and controlled only by large doses of morphin. Despite the risk, of which the patient is cognizant, she asks that we try to give her relief. We are going to approach the stone through a suprapubic opening into the bladder. This we believe to be less dangerous than doing a nephrectomy, and leaving the stone to cause probably continuance of pain and cystitis. Also, we believe this bladder approach preferable to a suprapubic incision down to the peritoneum followed by extraperitoneal exposure of the ureter by

peritoneal displacement because of the possibility of infection of the cellular tissue back of the bladder from the infected urine.

Dr. Wills believes the stone has been impacted and growing in size for several years, producing a chronic interstitial ureteritis and periureteritis which has obliterated the cellular space between the bladder and the anterior ureteral wall. This would permit us to enter the ureter without entering the cellular space.

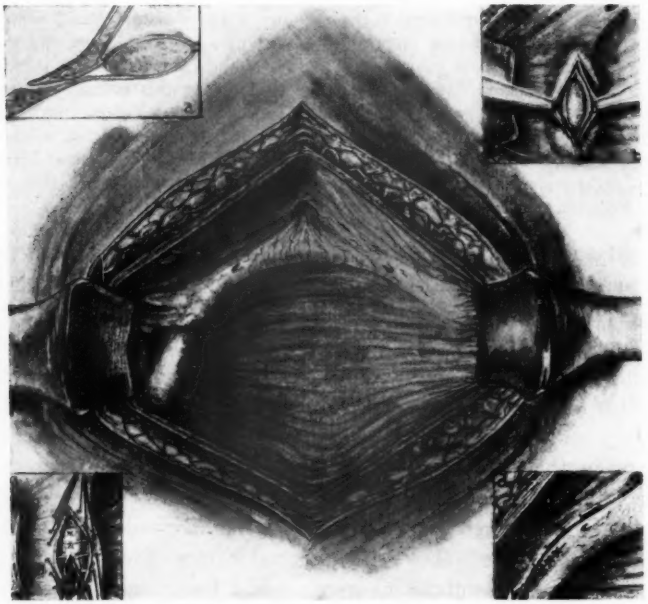


Fig. 457.—Transvesical approach to stone in lower ureter: *a*, Section showing relation of stone to bladder and ureter orifice. *b*, Incision through bladder wall and anterior wall of ureter. *c*, Sutures through bladder and ureteral walls. *d*, Ureteral catheter inserted through new ureteral opening.

The bladder is opened. The stone is lifted up by pressure through the vagina from its position as shown in the centre of Fig. 457. The bladder wall and then the anterior wall of the ureter are incised as shown in Fig. 457, *b*. They are adherent to each other as expected. The stone is lifted out with forceps.

Dr. Wills suggests, the ureter being strictured just inside the normal ureteral orifice, that a new ureteral orifice be made. This we do as follows: A large ureteral catheter is passed into the ureter through the ureteral incision, then through the bladder, and out through the urethra. The openings in the anterior wall of the ureter and the posterior wall of the bladder are closed about the catheter (Fig. 457, *c*, *d*). The suprapubic bladder wound is closed about a large tube.*

* The patient suffered much from obstinate constipation after the operation. The suprapubic wound healed slowly. She left the hospital in two months in excellent condition, gaining weight, strength, and free from pain. She returned to the hospital in six weeks having had for two or three days past pain about the suprapubic wound and the passage of foul urine. Dr. Wills cystoscoped her and found an opening in the vertex of the bladder in the line of the cystotomy scar from which pus drained into the bladder when pressure was made on the external abdominal wall. Of great interest as to the excellent results of the ureteral operation was the observation that periodic jets of clear urine were seen coming from the completely healed newly made ureteral orifice. The suprapubic wound later opened, discharged, and the patient died of toxemia.

CLINIC OF DR. THOMAS O. BURGER

From the Surgical Clinic of Thomas O. Burger, Clyde J. Osborne, and Hall G. Holder, San Diego, California

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THE POOR GYNECOLOGIC RISK

Unfortunately many gynecologic cases coming to the surgeon for treatment are poor risks for any operative procedure. The many and varied pathologic conditions responsible for these cases are well known and generally recognized. In the face of urgent treatment, in spite of prevailing conditions, what are the factors of major importance in reducing mortality and morbidity? 1. Thorough general examination and correct diagnosis, thereby eliminating contraindications to operation or errors in judgment, for example, avoidance of laparotomy in the active stages of infection in the genital tract.

2. Proper preoperative care which includes (*a*) rest; (*b*) proper treatment of associated diseases; (*c*) maintenance of normal nutrition and water balance up to as near the time of operation as possible; (*d*) psychologic management to reduce the emotional hazard; (*e*) supportive measures to increase resistance, particularly referring to the use of blood transfusion in the debilitated and anemic from loss of blood, toxemia, or sepsis.

3. Operation: (*a*) Selection of the anesthetic: Will the risk from the particularly morbid condition plus the risk from the anesthetic be least with any form of inhalation anesthesia with associated varying degrees of metabolic upset, or with spinal anesthesia in which sequelæ are nil? Spinal anesthesia properly administered and controlled is the anesthetic of choice in this type of case. In the proper conduct of these cases there need be no compromised psychic state. Foods and fluids pre- and post-operatively need not be materially curtailed, and this com-

bined with the practical absence of ileus with this type of anesthetic is a great advantage to the poor risk. One of us recently reported a series of 151 gynecologic cases administered spinal anesthesia with no morbidity or mortality in which ephedrin was successfully used to prevent blood-pressure fall. There was no postanesthetic sequelæ other than headache, which occurred in only 1.9 per cent. of cases and in only one lasted more than twenty-four hours. (*b*) Proper technic involves, first, standardization of methods; second, antisepsis, concerning which mercurochrome in skin sterilization and intravaginal application pre- and post-operative has been helpful in diminishing morbidity; third, elimination of wasted time; fourth, gentleness; fifth, judicious choice of operative procedure; sixth, thoroughness, including absolute hemostasis; seventh, protection of uncontaminated areas from infection; eighth, conservation of body heat. All of the above are important in preventing disastrous postoperative complications such as shock, hemorrhage, infection, thrombosis, and injury to surrounding vital organs. (*c*) The selective use of radium when indicated.

4. Postoperative care, including (1) rest; (2) posture; (3) sufficient foods and fluids.

CASE REPORTS

Case I.—Mrs. T. A. E., who was forty-two years of age, entered Mercy Hospital November 9, 1927, with chief complaint of lump in the lower abdomen for the past six years. Severe hemorrhage per vagina two nights before admission, which caused her to be dizzy and very weak. Has had constipation and bladder trouble for many years.

Past health: Two normal deliveries, severe laceration with first; attack of appendicitis followed second child, was not operated upon.

Family history essentially negative.

Physical Examination.—There is marked anemia of the skin and mucous membranes. On abdominal examination a large pelvic tumor extending two to three fingerbreadths above the symphysis is palpated. Pelvic examination revealed a tumor associated with the uterus, firm in consistency, and regular in outline. There is bilateral laceration of the cervix and laceration and relaxation of the perineum.

Laboratory Examination.—Urine showed a few white blood-cells, few bacteria, otherwise negative; a blood-count on admission showed red blood-cells, 2,160,000; white blood-cells, 9500; hemoglobin, 21 per cent. (Dare); polymorphonuclears, 76 per cent.; small lymphocytes, 22 per cent.; large

lymphocytes, 2 per cent. The patient was transfused immediately on admission with 700 c.c. whole blood by way of the direct method (Scannell). Two days following, the blood-count showed red blood-cells 2,610,000 with 35 per cent. hemoglobin (Dare). The following day a second transfusion was done, giving 400 c.c. in similar fashion. Two days following this transfusion red blood-cells were 3,610,000, 48 per cent. hemoglobin (Dare). The following day a supracervical hysterectomy and right salpingo-oöphorectomy was done under spinal anesthesia, using 120 mg. novocain in second lumbar space. Patient made an uneventful recovery without any complications postoperative, taking a soft diet the following day and gained strength rapidly. On the date of discharge, 11/30/27, the wound had healed by primary union, the patient was feeling extremely well, and the red-blood-cell count at this time was 4,670,000; hemoglobin, 50 per cent. (Dare).

Pathologic report showed the uterus to be the site of a large degenerated fibroid.

Comment.—This case typifies the advantage of blood transfusion in preparation for operation in cases of secondary anemia due to the toxicity from uterine fibroids, and secondarily the marked advantage of spinal anesthesia in preventing complications postoperative in a poor risk.

Case II.—Mrs. J. M., aged thirty-two years, entered Mercy Hospital 11/15/27, with the chief complaint of metrorrhagia for the past two months, bleeding profusely at times. Patient has a chronic cough, which has bothered her for the past year. Is weak and dizzy and unable to work.

Past health: Usual childhood diseases, malaria nine years ago, influenza four years ago. Third child was born shortly after the attack of influenza, and patient has been in poor health since this time.

Physical Examination.—A markedly anemic, emaciated, and chronically ill-appearing young adult female was observed. Lungs: There was a dulness anterior and posterior at left apex with many persistent fine crackling râles at both apices, especially marked at the left. Heart, negative. Abdomen, negative. Pelvic examination: Showed a multiparous introitus; urethra and glands negative, cervix anterior in position, eroded and hypertrophied with old bilateral laceration; uterus enlarged one and a half times, third-degree retroversion, tender to palpation; adnexa negative. Nothing definite could be ascertained as to the cause of the metrorrhagia unless due to chronic metritis; it is more likely that the patient's generally debilitated condition was responsible for this symptom. *x*-Ray examination of the chest showed bilateral tuberculous involvement at both apices, more especially the left. Neuromuscular, negative; skin, negative. Laboratory report: Urine negative; red blood-cells 4,150,000, white blood-cells 5500, hemoglobin 80 per cent; polymorphonuclears 73 per cent., small lymphocytes 12 per cent., large lymphocytes 3 per cent., eosinophils 2 per cent. Tentative diagnosis—chronic metritis, bilateral pulmonary tuberculosis.

Operation: Under spinal anesthesia, using 120 mg. novocain in second lumbar space, supracervical hysterectomy and appendectomy were done. Pathologic report showed chronic fibrous appendicitis, chronic metritis, and endometritis. Patient made an uneventful recovery without postoperative complications, gained strength rapidly, and was discharged 12/3/27; wound healed by primary union, general condition much improved.

Comment.—This patient could have been most ideally treated with small doses of radium, ranging from 200 to 800 millicurie hours, to check uterine bleeding, but inasmuch as the case was one of charity, the necessary expense for the radium could not be met, and as the next most suitable treatment was removal of the uterus, this was done under spinal anesthesia, thereby avoiding the dangers of any inhalation anesthetic in advanced pulmonary tuberculosis.

Case III.—Mrs. A. P., forty years of age, entered Scripps Memorial Hospital with the chief complaint of fever, pain, and tenderness in lower abdomen, extreme constipation, and marked distention of the abdomen; has felt ill for some months.

Past health good. Family history unimportant.

Physical Examination.—Showed a middle-aged female in poor nutrition and apparently chronically ill. General physical examination negative except for marked tenderness in both lower quadrants of abdomen and on pelvic examination marked endocervicitis and the presence of two masses in either adnexal region the size of a grapefruit. Palpation in this region was extremely painful. Laboratory report: Urine negative; blood-count within normal limits. Tentative diagnosis—bilateral pyosalpinx.

On April 23, 1928, two large pus-tubes were removed under spinal anesthesia. The pelvis was the site of numerous adhesions and at one point, the terminal ileum, was almost completely obstructed by an adhesive band. Patient was discharged 5/6/28, wound healed by primary union, no postoperative complications whatever.

Comment.—This case of bilateral pyosalpinx with multiple adhesions causing partial intestinal obstruction was most satisfactorily operated upon under spinal anesthesia. Because of the perfect relaxation both infected tubes were removed without rupture or contamination, and the adhesions released and intestinal obstruction relieved with a minimum of trauma. The usual perfect convalescence was experienced.

Case IV.—Mrs. B. W., age thirty-four years, entered Scripps Memorial Hospital April 18, 1928, with chief complaint of amenorrhea for the past

three months, hyperemesis of pregnancy for past three months. She had been unable to retain any food and very little fluid during this latter period; conservative and more radical home treatment had been unsuccessful in controlling the hyperemesis.

Past health: For the past year patient had been undernourished and underweight, with associated marked lassitude. Had been under medical treatment without improvement.

Physical Examination.—Showed a young adult female, markedly emaciated; tongue red, dry and parched with acetone on her breath; patient obviously critically ill. Head negative but for findings listed. Chest: There are numerous persistent, fine crackling râles at apices of both lungs, percussion negative; expansion normal. At the left base in the posterior axillary line, there is a definite friction rub. Heart, negative. Through the thin abdominal wall the enlarged uterus may be definitely palpated. Pelvic examination shows uterus enlarged to size of three to four months' pregnancy; cervix soft, otherwise negative. Neuromuscular, negative.

x-Ray of the chest shows thickening of both hilar shadows, with many calcified areas; the diaphragm on the right side is irregular, apparently showing some adhesions with a very trifling amount of fluid in the costal angles; apices show evidence of chronic fibrous tuberculosis.

Laboratory Examination.—The urine shows +1 albumin, sugar negative, plus acetone; microscopic negative. Blood-count shows red blood-cells, 5,560,000, white blood-cells 12,400, hemoglobin 104 per cent., color index 95, polymorphonuclears 77 per cent., small lymphocytes 13 per cent., large lymphocytes 5 per cent., eosinophils 1 per cent., transitionals 4 per cent.

Operation: Under spinal anesthesia, using 50 mg. novocain in second lumbar space, therapeutic abortion was done. Postoperative course: Patient improved rapidly after emptying of the uterus; and with a high carbohydrate diet acidosis cleared up rapidly; patient made an uneventful recovery and when discharged was gaining weight rapidly.

Comment.—This case was a poor risk because of her critical condition as a result of acidosis secondary to pernicious vomiting of pregnancy. This, combined with her associated pulmonary involvement, made spinal anesthesia the anesthesia of choice. Her deranged metabolic state was not made worse or complicated.

Case V.—Mrs. M. H., age forty-four years, entered Mercy Hospital 4/24/28, with chief complaint of losing weight and strength for the past year, with considerable pain in lower abdomen for the past two months with associated profuse metrorrhagia.

Past health good. Family history unimportant.

Physical Examination.—Showed a markedly emaciated, anemic, chronically ill middle-aged adult female. Head and neck negative except for anemia of mucous membrane. Lungs negative; heart negative. Abdomen:

Negative except for tenderness in lower quadrants. Pelvic examination showed a cervix markedly hypertrophied and eroded, very friable, and bleeding on slight traumatism. The broad ligament on either side was infiltrated, so that the cervix could not be moved; attempted motion painful. The fundus of the uterus palpated normal in size and position.

Laboratory Examination.—Urine negative. Blood-count: Red blood-cells, 3,472,000; white blood-cells, 15,000; hemoglobin, 40 per cent. (Dare); polymorphonuclears, 80 per cent.; small lymphocytes, 7 per cent.; large lymphocytes, 11 per cent.; morphology of red blood-cells that of secondary anemia. Biopsy from cervix showed epidermoid carcinoma.

Operation: Under spinal anesthesia, using 50 mg. novacain in second lumbar space, cervix dilated and radium tandem inserted, giving 3000 millicurie hours radiation; bleeding checked.

Comment.—This patient will receive the balance of her radiation treatment, consisting of approximately 7000 millicurie hours intramural radiation in the cervix, plus a deep *x*-ray cycle. After initial dose described patient felt much improved and was discharged home to await remainder of treatment.

The value of radium as against any type of operative procedure in these cases is now universally recognized.

CLINIC OF DR. HALL G. HOLDER

FROM THE SURGICAL CLINIC OF THOMAS O. BURGER, CLYDE J. OSBORNE, AND HALL G. HOLDER, SAN DIEGO, CALIFORNIA

McARTHUR HERNIORRHAPHY

OPERATIVE procedures employed at the present time for the cure of inguinal hernia are far from satisfactory. This is true of the simple indirect inguinal hernia and increasingly so of the direct, sliding, and recurrent inguinal hernias. Supportive evidence for this statement may be found in the high percentage of recurrences at the hands of the best operators in the best hos-

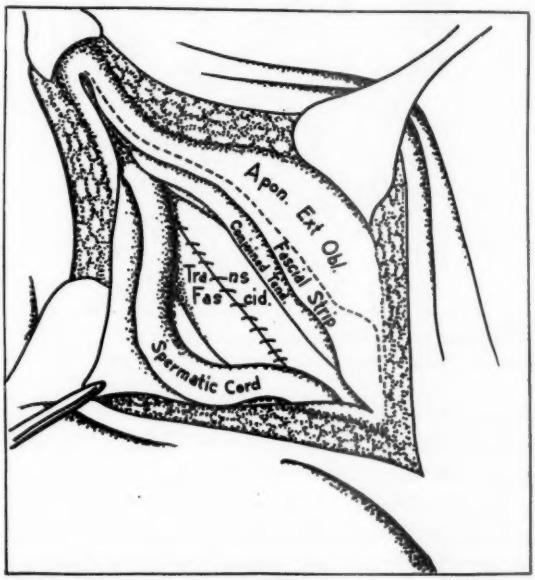

Fig. 458.—Showing sutured transversalis fascia. Note outline of fascial strip to be cut from mesial edge of external oblique aponeurosis.

pitals and clinics. Further evidence against the efficiency of present recognized procedures are the many different modifications advocated in recent years.

The importance as regards satisfactory end-result of high ligation of the sac and perfect wound healing need not be considered. Reconstruction of the abdominal wall needs more thought. Academic points, such as obliquity of the inguinal

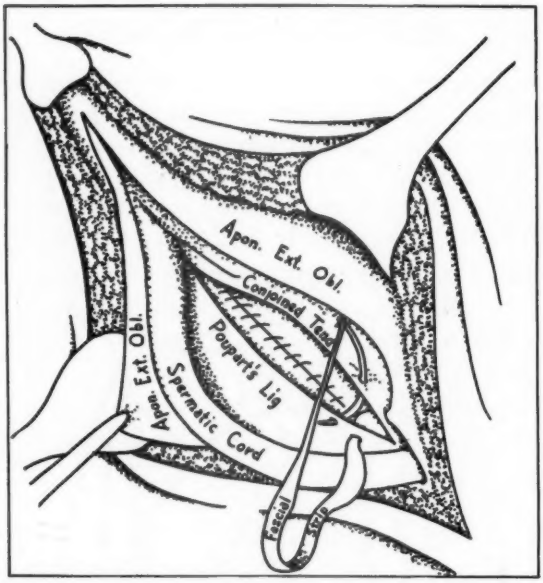

Fig. 459.—Approximation of conjoined tendon to Poupart's ligament with cut fascial suture, broad pedicle base reinforcing "weak spot" at lower angle.

canal, valve-like action of its walls, disposition of the cord, may be disregarded. The importance of the restoration of the transversalis fascia as advocated by Pitzman and others, when possible, is one of the most important steps in the repair. But unfortunately in those cases in which it is most important to obtain a repair of this fascia it either cannot be demonstrated or is so attenuated as to be of little value.

Disregarding the difference of opinion whether muscles will

unite with fascia—what is the simplest and most efficient plastic operation on the inguinal canal? Because of the nature of conditions in direct inguinal hernias, recurrent or even simple indirect inguinal hernias in the obese or those with attenuated musculature where normal relations are altered, it is logical that some type of fascial suture repair would maintain more substantial contact between structures if employed.

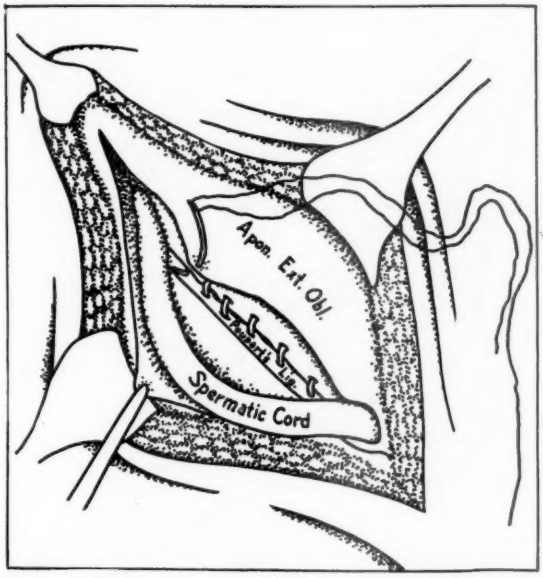

Fig. 460.—Fascial suture of conjoined tendon to Poupart's ligament completed. Beginning of approximation of mesial leaf of external oblique aponeurosis to inguinal ligament.

One of three methods are open to choice: (1) The method of E. Wyllys Andrews; (2) the use of living sutures according to the method of Gallie; or (3) living sutures and repair as advocated by McArthur. Using the method of Andrews consists in sewing the mesial flap of the external oblique aponeurosis to Poupart's ligament and then imbricating the lower flap over this suture line. This method I use routinely on simple indirect

inguinal hernias, utilizing in addition the transversalis fascia. Gallie in his method makes use of fascial strips cut from the fascia lata of the thigh. With these sutures he weaves a criss-cross closure of the different layers. This procedure is necessary in a certain number of cases, especially in large recurrent hernias with attenuated muscle and fascia. By this method heretofore hopeless cases have obtained cures. Its only dis-

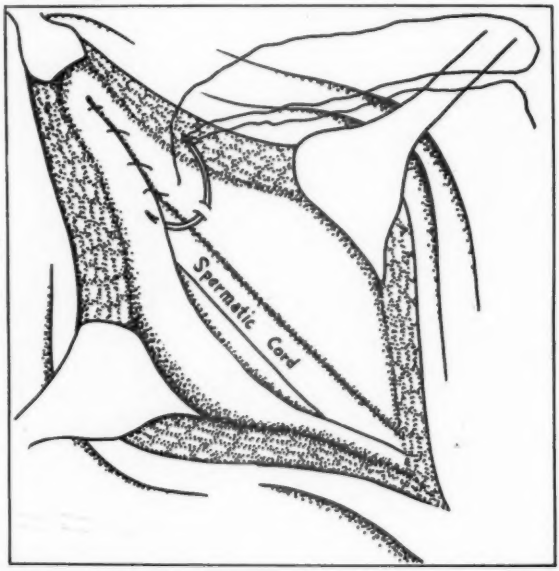

Fig. 461.—Repair completed with overlapping of the lateral leaf of the external oblique aponeurosis to reinforce the previous line of suture.

advantage is the length of time necessary for its consummation and the necessity for extra incision in the thigh.

The method of McArthur also makes use of living fascial sutures. McArthur's operation antedated Gallie's by many years. It has the distinct advantage of simplicity without need for extra incision and accomplishes fully as much where a large amount of fascia for suture is not required. In this operation a strip of fascia is cut from the edge of the mesial flap of the ex-

ternal oblique aponeurosis, leaving a pedicle base for blood-supply. By means of a special instrument or needle the strip is used to approximate the conjoined tendon to Poupart's ligament. The broad pedicle base of the flap supports the lower end of the closure, *i. e.*, "the weak spot." McArthur used a second fascial strip from the outer flap of the external oblique to unite this with the inner flap. To me this has seemed unnecessary in view of the perfect union of fascia when cleaned of all areolar tissue. Occasionally I use a second strip of fascia from the lateral flap to reinforce the primary line of suture if the first fascial suture is insufficient. The external oblique fascia is then approximated with continuous or interrupted No. 2 chromic catgut sutures. Overlapping is practised if this is possible without tension, the mesial leaf of the aponeurosis is sutured to Poupart's and the lateral leaf placed over this line of suture, thereby obtaining the advantage of an additional layer in the repair. The cord is transplanted in all cases.

CASE REPORTS

Case I.—F. W., male, age sixty-two years, admitted to hospital March 24, 1926; operated March 29, 1926; discharged April 12, 1926.

Present Illness.—Patient admitted to the medical side with the complaint of generalized pains and headache. No other symptoms except a rupture which had bothered him for years.

Physical Examination.—Essentially negative but for local condition which showed a somewhat dilated external inguinal ring on the left side. On coughing a large sac presented, with the inferior epigastric palpated lateral to the neck.

Operation.—Pathologic findings: There was on the left side a direct inguinal sac extending about 1 inch from the peritoneal cavity. The sac contained non-adherent small intestine and omentum which was easily reduced. The sac was not adherent to the cord, nor was the bladder visualized. The cord was normal. Musculature of fair quality.

Procedure: Under nitrous oxid-oxygen anesthesia a 5-inch skin incision was made parallel to Poupart's ligament in the line of the spine of the pubis and the spine of the ilium. The skin and subcutaneous tissues were incised to the external oblique fascia and the latter divided in the line of its fibers through the middle of the external ring. The conjoined tendon and Poupart's ligament were exposed and cleaned by blunt and gauze dissection. Incision was then made in the cremasteric muscle parallel to the cord, sac and cord freed from muscle and sac dissected free to base. Sac opened, contents reduced and neck ligated with purse-string, No. 2, chromic catgut. Redundant portion of sac then amputated and repair done by approximation of

attenuated edges of the transversalis fascia with a continuous suture of No. 2, chromic catgut. Conjoined tendon was then approximated to Poupart's ligament by means of a special instrument or needle. A wide pedicle base of the fascial strip was obtained for blood-supply and firm reinforcement of the "weak spot" at the lower angle. The fascial sutures were anchored at intervals with interrupted, No. 2, chromic catgut sutures. One suture was taken above the cord to form a 3-inch internal ring. Double layer repair was then done with the external oblique aponeurosis by suturing the mesial flap to Poupart's beneath the cord, reinforcing this line of suture with the lateral flap. Skin and subcutaneous tissues were approximated with interrupted silkworm-gut sutures. Dry dressing applied, patient to ward in good condition.

Discharge Note.—Patient made an uneventful recovery. The wound healed by primary union, solid repair, and no symptoms. Discharged home eleventh day postoperative.

Follow-up Note.—At three, six months, and one year periods examination showed repair to be solid with no evidence or symptoms or recurrence.

Case II.—F. T., male, age forty-five years, was admitted to the hospital February 8, 1926; operated February 9, 1926; and discharged February 26, 1926.

Present Illness.—While doing heavy work ten months prior to admission patient received rupture on both sides. Of late has had considerable pain in both groins, especially on straining or lifting. The patient never used a truss.

Physical Examination.—Essentially negative but for the local condition which showed a moderated sized bilateral direct inguinal hernia.

Operation.—Pathologic findings: There was on both sides a direct inguinal sac, on the right being larger and containing a loop of small intestine and non-adherent omentum which was easily reduced. The right cord showed small varicosities. The musculature was of good quality.

Procedure: Same technic on both sides as detailed in Case I.

Discharge Note.—Patient developed a purulent bronchitis which completely cleared up in ten days time under treatment. Discharged fourteenth postoperative day with wound healed by primary union, repair solid in spite of severe cough associated with bronchitis.

Follow-up Note.—Two years after operation with no recurrence and complete relief of symptoms.

Case III.—A. J., male, age forty-two years, admitted February 18, 1926; operated February 19, 1926; discharged March 6, 1926.

Present Illness.—Patient has noticed annoying pain in left groin with associated swelling of left scrotal sac for past six months. The mass in the scrotum has been gradually increasing in size. In the recumbent position the mass is easily reducible.

Physical Examination.—Unimportant but for presence of large left scrotal indirect inguinal hernia.

Operation.—Pathological findings: On the left side there was an indirect inguinal sac extending down into the scrotum. The sac contained a con-

siderable amount of non-adherent omentum and coils of small intestine which were easily reducible. The sac was not adherent to the cord, the cord normal, and the musculature fair.

Procedure: That detailed under Case I.

Discharge Note.—Uneventful course, wound healing by primary union, stitches removed seventh postoperative day, patient discharged fifteenth postoperative day with no complaints. Repair solid.

Follow-up Note.—This patient was followed for only nine months, but at the end of that time repair was solid without evidence of recurrence.

Case IV.—A. H., male, age fifty-one years, admitted February 8, 1926; operated February 26, 1926; discharged March 15, 1926.

Present Illness.—Patient admitted to genito-urinary division with chief complaint of frequency of urination which was found to be secondary to an old stricture of the posterior urethra and chronic cystitis. After treatment for the stricture he wished to have his bilateral rupture treated. This he thought was caused by the straining associated with micturition. Of late has had an annoying bearing down sensation in both groins while standing.

Past History.—Mastoid operation in 1918; typhoid in 1895.

Physical Examination.—Examination by the genito-urinary division revealed findings noted above. Routine laboratory test including blood-chemistry were normal. Patient presented a bilateral direct herniation in both inguinal regions, worse on the left.

Operation.—Pathologic findings: There was on both sides a direct inguinal sac which was non-adherent to the surrounding structures. On the left side sac contained omentum and a loop of small intestine. The cord was normal and the musculature of good quality.

Procedure: That described under Case I.

Discharge Note.—Patient's recovery uneventful, wound healed by primary union, sutures out seventh postoperative day, out of bed the fourteenth day. Repair solid, patient feels well and has no complaints.

Follow-up Note.—At the end of one year the repair is firm on both sides, the patient has had no return of symptoms and no complaints relative to his hernia, although he still complains of frequency of urination.

Case V.—H. H., male, age fifty years, admitted May 4, 1926; operated May 7, 1926; discharged May 20, 1926.

Present Illness.—Patient has had a noticeable rupture for the past eight months. Walking, lifting, or strenuous exercise causes slight pain in the right inguinal region.

Physical Examination.—Negative, but for the local condition which reveals a moderate sized herniation in the right inguinal region on straining, with palpation of the epigastric artery lateral to the neck of the sac. The external and internal inguinal rings are markedly enlarged.

Operation.—Pathologic findings: There was on the right side a direct inguinal sac containing small intestine and non-adherent omentum. The cord was normal and the musculature of fair quality.

Procedure: That detailed under Case I.

Discharge Note.—All sutures out the seventh postoperative day. There

was one stitch infection at the lower angle, wound edges separated and serum discharged, delaying complete union until fifteenth postoperative day. Discharged with firm repair, wound healed, and complete relief of all symptoms.

Follow-up Note.—Eighteen months after operation there had been no recurrence, no complaints.

Case VI.—L. J., male, age thirty-six years, admitted September 8, 1926; operated September 12, 1926; discharged September 26, 1926.

Present Illness.—Rupture on right side for the past four years, the swelling at times causing discomfort. Reduced with ease, truss used since onset.

Physical Examination.—Negative, but for presence of large scrotal hernia with an indirect sac on the right side.

Operation.—Pathologic findings: There was on the right side a large indirect sac extending into the scrotum of that side, containing portions of adherent omentum and coils of small intestine. The sac was adherent to the cord which was normal in every other respect. The musculature was good.

Procedure: Same as detailed under Case I.

Discharge Note.—The patient made an uneventful convalescence. The wound healed by primary union, all sutures being removed the seventh postoperative day, the patient up and home the eighteenth day. Repair firm, no complaints.

Follow-up Note.—Patient examined fourteen months after operation without evidence of recurrence. No complaints.

Case VII.—A. K., male, age forty-six years, admitted September 6, 1926; operated September 8, 1926; discharged September 22, 1926.

Present Illness.—Patient, a steel worker doing heavy lifting, first noticed a swelling in the left groin five months ago. This had been steadily increasing in size. On coughing or straining it is frequently the size of an orange. For past two months has had nausea after meals with associated alternate constipation and diarrhea. Truss unsuccessful.

Physical Examination.—General physical examination, including laboratory and *x*-ray check-up revealed nothing but the local condition. Examination of the left inguinal region shows a large direct herniation.

Operation.—Pathologic findings: On the left side there was a large direct sac containing small intestine and omentum. The cord was normal and the musculature of good quality.

Procedure: Same as detailed in Case I.

Discharge Note.—Patient's convalescence uneventful. Wound healed by primary union, all sutures removed seventh postoperative day, discharged home fourteenth postoperative day feeling well. On straining repair is firm.

Follow-up Note.—Examination eighteen months after operation shows no evidence of recurrence. Complete relief from gastric symptoms.

Case VIII.—J. J., male, age thirty-eight years, admitted October 2, 1926; operated October 4, 1926; discharged October 19, 1926.

Present Illness.—For the past four years patient has been bothered with a rupture on the left side. Patient's occupation entails heavy lifting and of

late, in spite of the support of a truss, has had considerable pain and discomfort, especially on straining. For the past year obstinate constipation has appeared for the first time, necessitating daily laxatives.

Past Health.—Always good, never has had any serious illness.

Physical Examination.—Well-developed, middle-aged, male adult with negative findings except for the local condition. In the left inguinal region there is a prominent herniation, which increases in size on straining. The inferior epigastric artery is palpated lateral to the neck of the hernial sac. The internal and external inguinal rings are markedly distorted. Impression, left direct inguinal hernia.

Operation.—Pathologic findings: On the left side there was a direct sac with absent posterior and lateral walls, these being replaced by the sigmoid colon. The sigmoid was considerably dilated and completely filled the sac. The sac was not adherent to gut, cord or other surrounding structures. The cord was normal and the musculature of good quality. This condition represents the so-called "sliding" hernia.

Procedure: The anterior and mesial walls of the sac were removed and the peritoneal defect closed. Repair was then done as detailed in Case I.

Discharge Note.—Patient's convalescence was uneventful, the wound healed by primary union, so that all sutures were removed the seventh postoperative day and the patient discharged home the fourteenth postoperative day. Repair solid with no symptoms or complaints.

Follow-up Note.—Patient seen at intervals for the past fourteen months. No evidence of recurrence, no return of symptoms, constipation much improved.

Summary and Conclusions.—A total of 10 McArthur herniorrhaphies were done on 8 patients. Among this number were 5 cases of direct inguinal hernia, 2 presenting bilateral involvement. One patient had a direct sac in which the posterior and lateral peritoneal walls were represented by dilated sigmoid colons, a so-called "sliding" hernia. Two large indirect inguinal hernias with scrotal sacs complete the series.

It is justly recognized that the above types of inguinal hernia represent the most difficult in which to obtain satisfactory results.

A modified McArthur herniorrhaphy technic was employed in each instance. Definite cure was obtained in every case as shown by follow-up observations one to two years after operation.

This technically simple, fascial-suture procedure, applicable to a wide range of difficult hernias merits more consideration than heretofore it has obtained.

CLINIC OF DR. CLYDE J. OSBORNE

FROM THE SURGICAL CLINIC OF THOMAS O. BURGER, CLYDE J. OSBORNE, AND HALL G. HOLDER, SAN DIEGO, CALIFORNIA

CARCINOMA OF THE SIGMOID COLON: REPORT OF A CASE WITH TREATMENT

J. R., male, a meat packer, sixty years of age, entered the Mercy Hospital May 11, 1927. Except for complaint of hemorrhoids two years previous to admission, which were of short duration, his past health was good. Constipation, his chief complaint for the past year, was increasing in severity, and for the past three months had been extreme, at times alternating with diarrhea. During this time defecation has been painful and formed stools ribbon-like in character. There were associated complaints of lassitude, backache, and pain down the legs with 25 pounds loss of weight.

Physical examination showed an apparently well-nourished elderly male, not acutely ill. The cardiovascular system was well within normal limits. The chest presented no positive findings. Careful abdominal examination evidenced no palpable tumors or areas of tenderness. A definite right indirect inguinal hernia and moderately enlarged soft and symmetric prostate were palpated. The 18-inch sigmoidoscope was passed with difficulty due to a severe irritation of the rectum as a result of frequent enemata, but nothing except this condition and a very much dilated rectum was visualized.

Laboratory examinations showed the urine to be normal; the blood-count showed red blood-cells, 4,490,000; white blood-cells, 5700; hemoglobin, 80 per cent.; differential count being normal. The Wassermann was negative. *x*-Ray examination with the barium enema showed a point of definite obstruction with marked filling-defect at the sigmoid flexure. Barium, given for a gastro-intestinal series eight days before, remained in the descending colon in spite of frequent cathartics.

In view of the clinical and *x*-ray findings a diagnosis of malignancy of the sigmoid colon was made and operation advised.

Operative Procedure.—Operation, May 12, 1927. General condition of the patient good. Temperature 98° F.; pulse 80; respirations 20. Under ether anesthesia a 6-inch, lower left paramedian incision was made. The liver did not show evidences

Fig. 462.—Barium enema before operation showing obstruction and filling-defect in the sigmoid colon.

of metastasis, nor were glands palpable in the pre-aortic group of inferior mesenteric nodes. Two almond-sized nodes were palpable in the mesosigmoid along the second sigmoid artery. The growth occupied the lower third of the sigmoid colon, annular in arrangement, and produced obstruction to the point of

scarcely admitting the finger-tip. The pelvic colon was not adherent to the posterior pelvic wall or coils of small intestine. The sigmoid proximal to the growth was considerably dilated with slightly thickened walls.

It was noted that the growth could be removed including a sufficient amount of normal sigmoid above and below without

Fig. 463.—Barium enema taken one year following operation. Note normal lumen at rectosigmoid junction.

interrupting the blood-supply of the upper rectum. In view of this, the sigmoid arteries with the upper marginal branches were ligated with the idea of excising the sigmoid sufficiently on both sides of the growth. The lower third of the descending colon and sigmoid were mobilized in the usual way. Having thus effected

a good exposure of the sigmoid, the mesosigmoid in apposition with growth was cut within the confines of the ligatured vessels, and the field of operation packed off well in all directions. The sigmoid was clamped above the growth with Payr's clamps, removing 8 inches of the sigmoid with the cautery. Approximation of the cut ends of the sigmoid was easily accomplished. The proximal sigmoid was clamped with an intestinal clamp and

Fig. 464.—Sagittal section showing portion of the tube sutured to proximal colon. (Moynihan, Abdominal Operations, 4th ed.)

the Payr clamp removed, steadying the cut end with Allis' forceps. The distal cut end of the sigmoid was grasped with Allis' forceps and the Payr clamp likewise removed. A large $\frac{3}{4}$-inch tube with lateral eye was passed through the distal sigmoid out through the rectum. The proximal end of the rubber tube was then inserted into the proximal cut end of the sigmoid for a distance of 4 cm. The rectal-tube was held in place by a single

No. 2 chromic catgut suture passed through all coats of the proximal loop. Traction on the rectal tube protruding from the anus was now made sufficient to allow the proximal cut end of sigmoid to be drawn within the distal segment, producing an intussusception for a distance of 1.5 to 2 cm. To effect an anastomosis a double row of interrupted No. 0 chromic catgut

Fig. 465.—Section showing anastomosis completed, note position of tube. (Moynihan, Abdominal Operations, 4th ed.)

sutures were placed with less difficulty than anticipated. All raw areas remaining after mobilizing the colon and the cut ends of the mesosigmoid were carefully covered. The presenting omentum was then brought down and sutured completely around the site of anastomosis. Abdomen drained with Penrose tubing above the site of anastomosis.

Pathologic Report.—The specimen represents about 8 inches

of the sigmoid colon, containing in the midportion a firm indurated mass measuring 4 inches in diameter. The gut proximal and distal to the growth is markedly dilated. On sections the neoplasm is of homogeneous consistency, producing an annular constriction of the lumen, so that a lead pencil can with difficulty be introduced. Microscopic section shows the characteristic structure of adenocarcinoma.

Convalescence was uneventful. The fluid balance was carefully maintained the first postoperative day. The abdominal drain was completely removed the seventh postoperative day, the rectal-tube on the ninth. The patient was discharged the fifteenth day postoperative with completely healed wound, feeling well, and having regular bowel movements without discomfort and eating a high caloric low residue diet without difficulty. During the past year the patient has gained 40 pounds in weight, feels very well, and is on an unlimited diet. The bowels are regular without catharsis. On May 20, 1928, one year after operation, barium enema showed the rectum and colon to be regular in outline and without evidence of infiltration. The lumen was of normal size and without evidence of stricture.

Comments.—This case is presented to recall a comparatively simple one-stage operation, giving the most physiologic end-result. It is realized that it is only applicable in that percentage of cases occurring in the sigmoid colon that may be freely mobilized, and where, because of slow obstruction, the general health has not been greatly impaired. In favorable cases operation can usually be accomplished without serious peritoneal contamination. The in-dwelling rectal tube is a valuable tractor during operation and by the relief of tension induces the best condition for a firm anastomosis. Postoperatively the tube favors the suture line by establishing drainage for gas and fecal material, and permits of safe irrigation if necessary. Any practical procedure which eliminates the unnecessary and prolonged discomfort incident to an artificial anus is a boon to the patient.

CLINIC OF DR. S. L. CALDBICK

EVERETT CLINIC, EVERETT, WASHINGTON

TWO CASES OF VISCERAL FISTULA. TREATED WITHOUT SECONDARY OPERATION

Case I.—R. G., an American truck driver, age thirty years, was admitted to the hospital November 3, 1927 as an emergency. He had had a little sour stomach for several months but had given it no attention. Two hours before admission he had a sudden attack of knife-like pain in the upper abdomen, accompanied by symptoms of severe shock. He was seen at home and sent at once to the hospital.

The family history was unimportant.

He had the usual acute infections of childhood, and a nephrectomy in 1923.

Examination showed a fairly well-developed and nourished adult, white male, who exhibited all of the cardinal signs of severe shock.

The head and neck were normal. The heart was well within normal limits and regular, and the lung fields were clear. The abdomen was scaphoid and showed board-like rigidity throughout. Tenderness was everywhere extreme, but particularly marked in the upper quadrants. None of the viscera were palpable, and no tumor mass could be made out. There was a well-healed surgical scar in the right loin. There were no other important physical findings. The urine showed a trace of albumin and a few broken hyaline casts. The leukocyte count was 14,000 with 81 per cent. of polymorphonuclears.

The diagnosis of a perforated peptic ulcer was made, and the abdomen opened under ether anesthesia. A perforation through a large indurated ulcer on the anterior wall of the stomach near the pylorus was easily demonstrated. The ulcer was excised after the manner of Judd, and the wound closed in three layers. The gall-bladder and appendix, which were also chronically diseased and very adherent to surrounding structures, were removed

in the usual manner, and one Penrose drain was inserted at the site of the gall-bladder. During the operation he received 2000 c.c. of physiologic saline by subpectoral infusion, and he was returned to his room in better condition than when he was taken to the operating room. From the first he was a very difficult patient to control. Forbidden fluids by mouth, he drained the contents of his ice-cap the night after operation, and on the fourth postoperative day eluded his nurse, crossed the hall to the lavatory, and drank a large quantity of water, which was shortly afterward discharged through the abdominal wound. During the following eight days everything was withheld by mouth. He was given 1000 c.c. of 10 per cent. glucose solution, intravenously twice daily, and 2000 c.c. of physiologic saline by subpectoral infusion once each day. His condition remained satisfactory and on the twelfth postoperative day small feedings at two-hour intervals were instituted. These were gradually increased until the twenty-fifth day, when he received a small soft diet. He was discharged on the thirtieth day in excellent condition with the wound completely healed.

Case II.—A. M., white American rancher, age sixty-seven years. Entered the hospital on June 13, 1926 with a complaint of epigastric distress of ten months' duration. The pain had no relation to meals or to the eating of any particular articles of food, although he had on one or two occasions felt nauseated before partaking of some cream. A year previously he had an attack of severe epigastric pain, lasting a few hours and followed by some jaundice. In the two months before coming to the hospital he had lost about 15 pounds in weight, had noticed a persistent yellow tinge to the skin, and had been bothered by pruritis. The urine had been constantly darker than normal, and the stools light colored.

The family history was unimportant.

He had typhoid fever at the age of twenty. No other serious illness and no operations.

Examination showed an elderly white male, somewhat underweight, and manifestly ill. The skin and scleræ were definitely icteric.

The head and neck showed nothing of importance. The heart was not enlarged and the lung fields were clear.

The abdomen was flat with thin soft walls.

The liver edge was palpated 2 fingerbreadths below the costal margin and the spleen was not felt.

There was considerable tenderness on pressure over the gall-bladder and about McBurney's point, but no definite tumor masses could be made out. There were no other significant physical findings. The laboratory examinations were unimportant except for trace of bile in the urine. The blood Wassermann was negative.

x-Rays of the gall-bladder area twelve hours after ingestion of the dye were negative.

Based upon the history and physical findings in this case, the diagnosis of chronic cholecystitis with cholelithiasis and stone in the common duct was made, and on June 16th abdominal section was performed. On opening the abdomen a firm, irregular mass was felt in the gall-bladder area which upon separation of many adhesions between the gall-bladder and surrounding viscera was found to be the common duct filled with stones. The gall-bladder itself was shrunken, thick walled, and contained very little bile. The stomach and duodenum were normal except where adherent. The common duct was incised and one stone the size of a small egg and many smaller stones were removed. The common duct was closed in two layers and the gall-bladder drained in the usual manner. A small perforation in the duodenum resulting from the separation of adhesions was closed with a purse-string suture, and a cigarette-drain inserted in that area. The patient was returned to the ward in good condition. His convalescence for two days was uneventful. On the third postoperative day there was a profuse discharge of fecal matter and undigested food through the incision. Rectal alimentation, daily intravenous infusions of 10 per cent. glucose solution, and subpectoral infusions of physiologic saline were undertaken as supportive measures. On the fifteenth postoperative day he was allowed a liquid diet, and on the twentieth day a light diet. He was discharged by wheel-chair on the thirty-fifth day after operation, in excellent condition. A small amount of bile was still draining from the wound, but there was no discharge of intestinal contents.

Comment.—I present these 2 cases of visceral fistula arising after abdominal section with the idea of emphasizing the importance and the entire practicability of conservative treatment in cases of this sort. In neither case did the patient's condition justify a secondary operation, and it is my belief that such a procedure would surely have resulted fatally. The ease with which intravenous nutrition may be carried out and the entirely satisfactory results obtained through its use should certainly commend it to the attention of every conservative surgeon.

Both of these patients have been seen frequently since leaving the hospital and at the present writing remain quite well.

TWO CASES OF PERSISTENT OMPHALOMESENTERIC DUCT

Case I.—Baby W., age eighteen days, a white male infant of healthy parentage. Birth weight 9 pounds, 9 ounces; present weight 9 pounds. Normal birth from a vigorous young primipara. The umbilical cord separated on the fourth day after birth and on the fifth day there was a profuse discharge of fecal material through the umbilicus, although the bowels had moved naturally on the previous day. Following the occurrence the bowels continued to pour their contents several times daily through the umbilical fistula, moving but little by rectum. Failure of the child to gain in weight, although the mother had an abundance of milk, necessitated surgical measures to close the persistent omphalomesenteric duct which was too large in caliber for closure by irritating methods or cauterization.

Operation was performed under ether anesthesia. The umbilicus was carefully disinfected and walled off with drapes. An incision $1\frac{1}{2}$ inches long was made laterally to it and the rectus fibers retracted laterally. On opening the peritoneum a duct $1\frac{1}{2}$ inches long and $\frac{1}{2}$ inch in diameter, connecting the ileum with the umbilicus, was disclosed. It was ligated close to the bowel and at a point about $\frac{3}{4}$ cm. distally and divided by cautery. The stump was inverted by a purse-string suture and the abdomen closed in layers. The wound was sealed with collodion. The umbilicus was then exposed and with a small Kelly forceps the duct was caught and everted in the manner of turning out a glove-finger, ligated, and trimmed off. A small dressing was applied.

The child made an uneventful convalescence. Food was withheld for twenty-four hours, the child being then returned to the breast. The bowels moved daily without aid; the infant was taken from the hospital five days later in excellent condition with the wound clean and fairly well healed.

Case II.—Mrs. A. M., a white American housewife, age thirty-two years, entered the hospital March 4, 1928 with a complaint of recurring attacks of pain in the lower abdomen. The first attack occurring fourteen years before had been diagnosed acute appendicitis and the appendix had been removed.

A similar attack occurred six months later and others followed at intervals of three to six months. The pain was always localized in the lower abdomen on the right side and was of a severe colic-like character, associated with vomiting and lasting from three to twelve hours.

The past personal history and the family history were not important. Examination showed a rather poorly developed and poorly nourished adult white female, not acutely ill. The head and neck were normal. The heart showed no enlargement or irregularity, and the lungs were clear. The abdomen was scaphoid with thin soft walls. None of the viscera were palpable, and no definite tumor masses could be made out. There was acute tenderness with muscle spasm over the lower abdomen, especially on the right side. The genito-urinary system was entirely normal.

Laboratory examination of the blood and urine showed both to be normal. The blood Wassermann was negative.

Gastro-intestinal *x*-rays after a barium meal showed no abnormality. In view of the history and in the absence of intra-abdominal pathology demonstrable by *x*-ray, a diagnosis of postoperative adhesions producing partial intestinal obstruction (with an appended note that a Meckel's diverticulum must be looked for) was made by my associate, Dr. Gunderson.

On March 5, 1928 abdominal section was performed. The pelvis was explored, and a small cystic ovary was removed. The cecum and ileum were then examined and at a point about 18 inches above the cecum a thick band, in appearance not unlike narrowed bowel, was found connecting the ileum with the umbilicus. This was freed from adhesions, clamped close to the bowel, ligated, divided, and the stump inverted. The band of bowel was then traced to the umbilicus and excised. On being opened it was found to be patent. The patient made an uneventful recovery and left the hospital on the twelfth postoperative day in good condition.

Comment.—These 2 cases are presented as interesting examples of a not very common condition, the persistent omphalomesenteric or vitelline duct. In the case of the infant the diagnosis, of course, presented no difficulties, the only question arising being the advisability of surgical interference at so early an age. The second case brings up again the importance of careful exploration at laparotomy in order that the patient may later be spared the discomfort and the operator the humiliation of such an oversight.

CLINIC OF DR. ARTHUR B. CECIL

HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES

TREATMENT OF A CASE OF MALE HYPOSPADIAS

R. C., Los Angeles Children's Hospital, No. 28642.

Born February 12, 1916. Admitted to the Children's Hospital September 14, 1920. Complaint: Malformation of penis and Mother stated child urinated from an opening in front of the rectum. Two other children, living and well. Father and Mother, living and well. Child full term. Examination showed a well-nourished and well-developed child, except for deformity of the genitalia. The penis was found to be sharply curved down-

Fig. 466.

ward and held there by a strong fibrous band. The prepuce was lacking on the under surface and was hood-like above. There was practically no scrotum, and the testicles could not be palpated. In the perineum within a slit-like pouch is the opening of the urethra, through which the child voided urine. (See Fig. 466.) The child has perfect control of urination. Blood and urine were normal.

Operation No. 1. Division of Fibrous Band for Correction of Curvature of Penis.—Ether anesthesia. With the penis pulled upward a transverse

Fig. 467.

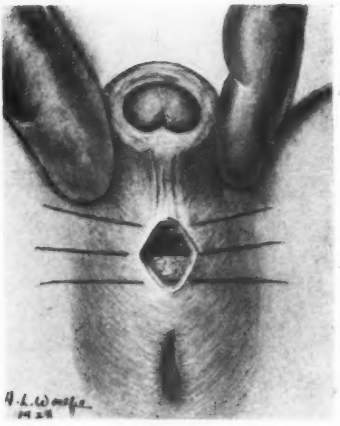

Fig. 468.

incision was made across the skin and fibrous band which held it in a downward curvature. After ligation of all bleeding-points the skin was closed after Heineke-Mikulicz method. (See Figs. 467–469.)

As a result of this operation the penis became free and normal so far as elevation was concerned.

Operation No. 2. Circumcision and Plastic Formation of Urethra from Foreskin.—The child now nine years old. Was admitted March 2, 1925.

Fig. 469.

Ether anesthesia. The hooded foreskin was pulled forward and in order to facilitate the circumcision in a well-defined line straight intestinal needles

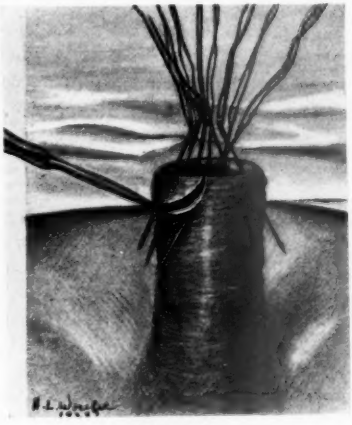

Fig. 470.

were passed through the skin from within outward. (See Fig. 470.) The foreskin was partially removed leaving a pedicle in the region where the frenum would naturally be. (See Fig. 471.) The foreskin was now opened and sutured

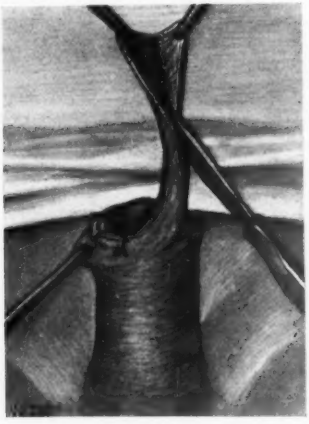

Fig. 471.

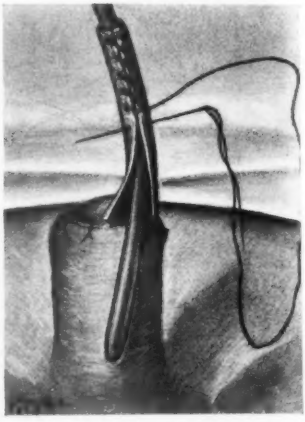

Fig. 472.

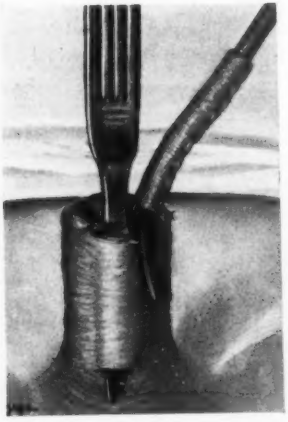

Fig. 473.

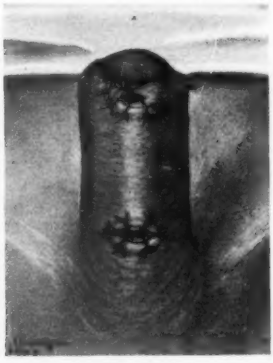

Fig. 474.

about a No. 14 rubber-catheter leaving an end of the suture long in order that the skin might not slide upon the catheter when the catheter and foreskin were pulled under the skin of the dorsum of the penis. (See Figs. 472, 473.)

The completion of the graft is shown in Fig. 474. The skin-graft took perfectly.

Operation No. 3. Skin-graft from the Thigh to Form Urethral Canal After the Method of Nove-Josserand (March 31, 1927).—A hexagonal flap of skin was removed from inner aspect from the right thigh measuring about 10 by 4 cm. This flap of skin was sutured about a No. 10 soft-rubber catheter and this tubular graft was introduced beneath the skin of the penile urethra, extending from the region of the proximal portion of the foreskin-graft for a distance of approximately 10 cm. The graft did not seem to slough out, but was apparently absorbed as it did not produce a canal and nothing was seen of it when the child was operated by Hagner's technic on January 13, 1928.

Operation No. 4. Hagner's Skin-flap Technic (January 13, 1928).—Child now twelve years old. The stages of this operation are so well shown in Figs. 475–479 that no description is necessary. Iodin and alcohol were

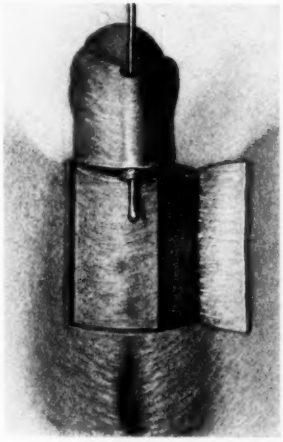

Fig. 475.

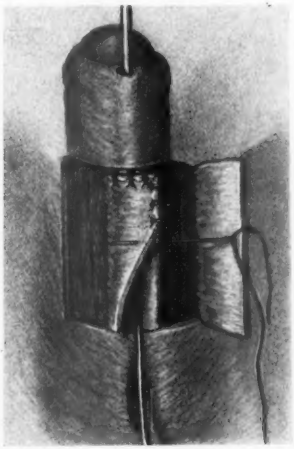

Fig. 476.

used for cleaning up; No. 00 catgut was used for the deeper sutures, and all stay sutures were of silk. No difficulty was encountered in anastomosing this newly formed urethra with the urethra which had previously been fashioned from the foreskin. This graft took perfectly and a continuous urethral canal was the result extending from the glans to within 2 cm. of the hypospadiac opening in the perineum.

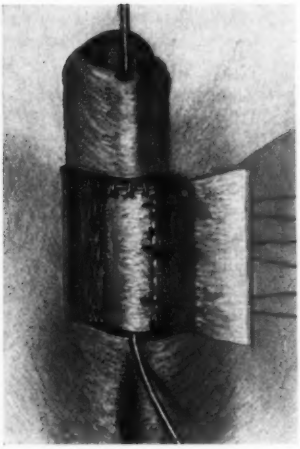

Fig. 477.

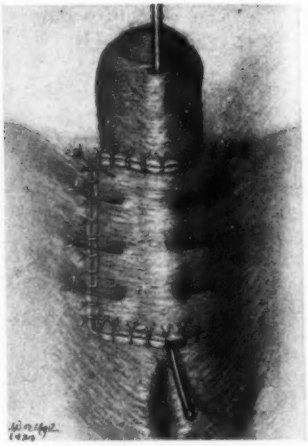

Fig. 478.

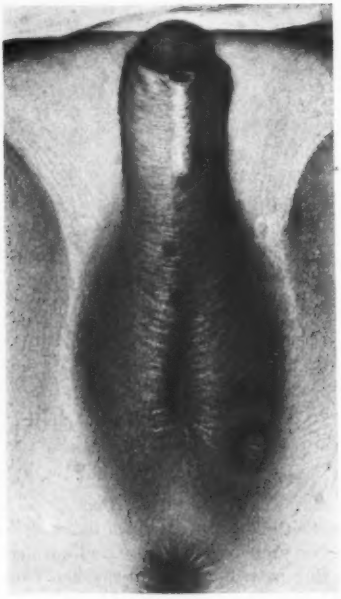

Fig. 479.

Operation No. 5. Suprapubic Drainage. Plastic Operation on Perineum for the Completion of Urethra in Perineal Hypospadias (March 27, 1928).—

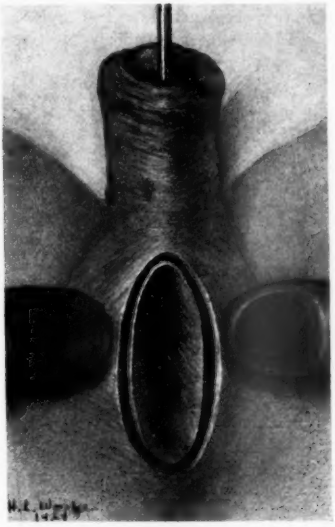

Fig. 480.

Suprapubic drainage. The urethra constructed about sound as shown in Figs. 480–482. No. 00 catgut was used for the deeper sutures, and silk

Fig. 481.

for the skin sutures. This plastic operation also took perfectly, and the good result obtained was due to the absolute continuous watching of the suprapubic drainage-tube by efficient nurses. I consider this one of the most im-

portant features in the curing of these cases. It has been suggested that plastic operations on the urethra should not be undertaken until the patient is old enough to appreciate the absolute necessity of perfect care of the drainage-tube in the final reconstruction of the urethra. This is not at all necessary, but it is necessary that the tube be continuously watched night and day by a nurse.

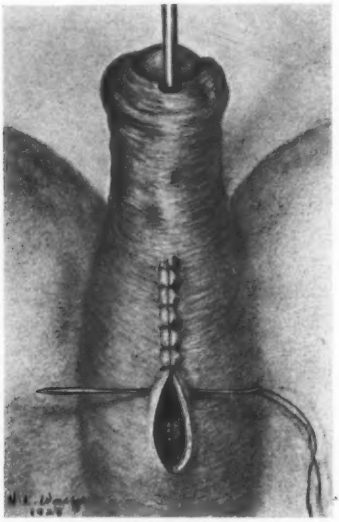

Fig. 482.

Result of Plastic Operations for the Cure of Case 28642.—The child was discharged from the hospital on April 19, 1928 at which time the suprapubic and perineal wounds were closed. A No. 14 catheter could be passed into the bladder through the new-formed urethra. At this writing, approximately two months after child was discharged he voids urine in a normal fashion.

TREATMENT OF A CASE OF MALE EPISPADIAS

L. G., Los Angeles Children's Hospital.

On June 8, 1922 there was admitted to the Los Angeles Children's Hospital a boy four years old who, since birth, had had constant dribbling of urine from an opening below the symphysis at the root of the penis. The child was a forceps delivered one, and at birth weighed 7½ pounds. He was well nourished and well developed.

His general physical examination was negative except for the malformation which I will now describe to you. The pubic bones were joined together by a fibrous band, 3 cm. in diameter. The thighs were rotated outward.

Fig. 483.

At the root of the penis was an opening, through which one could almost insert the little finger, and from which there was constant dribbling of urine. The penis was retracted and turned sharply upward upon the lower abdominal wall. It was flattened, excoriated by urine, and the urethral canal was entirely open. On its undersurface the foreskin was markedly redundant. (See Figs. 483, 484.) The testicles were normal and were within the scrotum. The urine showed a slight trace of albumin and a few pus-cells. The blood was normal.

Fig. 484.

Operation No. 1. Suprapubic Cystotomy for Repair of Internal Vesical Sphincter (June 9, 1922).—Midrectus incision. Bladder was found to be about the size of a walnut. The internal vesical sphincter was widely dilated. An attempt was made to tighten the internal vesical sphincter by denuding a moon-shaped piece of mucous membrane from the lateral and posterior walls of the internal urethral orifice, and by suturing. This produced a tight internal vesical sphincter. The bladder was closed except for a suprapubic drainage-tube.

The result of this procedure was totally worthless. The suprapubic wound became incrusted with lime-salts, and when it healed the child had the same incontinence as previous to the operation.

The procedure was not a proper one in the first place, as it consisted of plicating the only part of the internal sphincter which was normal. That is to say the posterior part, and did not consist in freeing the vesical neck and bringing it together anteriorly, which is the manner in which the internal sphincter should be repaired in these cases.

The child was lost sight of until April 27, 1926, when he was admitted to the Hospital of the Good Samaritan for further treatment. Examination at this time showed no change in his general condition, nor had there been any improvement in his control of urination. In the suprapubic region there was a broad scar from the previous suprapubic cystotomy.

Operation No. 2. Suprapubic Cystotomy for Repair of Internal Vesical Sphincter (April 28, 1926).—Midline incision. After exposing the bladder, which was found to be very small, the vesical neck was mobilized by separating it from the tissues beneath the fibrous band which held together the bones of the pelvis. In this region the bladder neck was found to be very thin and could be separated from the tissues beneath the fibrous band only with considerable difficulty. (See Fig. 485.)

Having freed the neck of the bladder a suprapubic opening was extended downward under the fibrous band which held together the pubic bones. This

Fig. 485.

incision was carried down as far as it seemed possible to introduce sutures. A small V-shaped portion was removed from the anterior aspect of the vesical neck. The vesical neck was now brought tightly together over a No. 12 catheter, and the closure was continued upward toward the ventral surface of the bladder culminating in the fixation of a suprapubic drainage-tube. (See Fig. 486.)

As a result of this operation the patient gained considerable control of his urine and for the first time knew what it was to have a desire to urinate. He could at will hold urine perfectly. Reflexly he held urine to the amount of 100 c.c. At times he would go without wetting his clothes, but at other

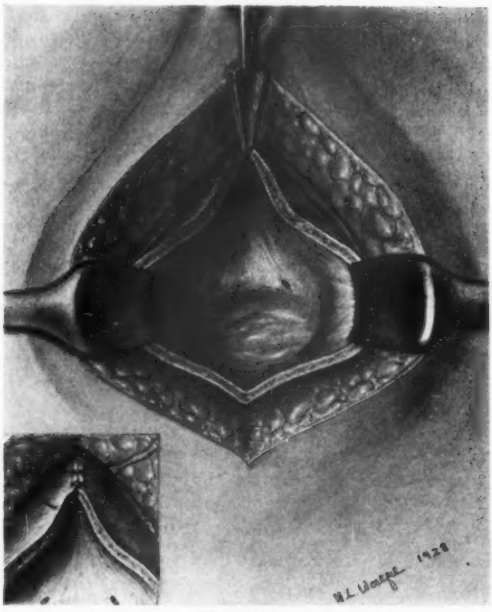

Fig. 486.

Fig. 487.

times some urine would escape. At night he had no incontinence. Big headway was made in the cure of this child by this operation.

Operation No. 3. Reconstruction of Urethral Canal in Epispadias (January, 1927).—Los Angeles Children's Hospital. Suprapubic drainage was established by cutting down on the tip of a curved sound. With the penis drawn well downward, strips of skin were denuded as shown in Fig. 487.

Fig. 488.

A deep suture was introduced to bring together the tissues of the urethra which were very close to the vesical neck. (See Fig. 488.)

This line of sutures was then continued throughout the extent of the penis, a sound being used not only to depress the penis and hold it in position, but also for the purpose of outlining the urethra. (See Fig. 489.)

The superficial tissues of the penis were now brought together with interrupted silk as shown in Fig. 490.

Following this operation there was considerable edema of the penis. This was probably due to the deep suturing which had been introduced around

the root of the penis to repair the sphincter muscle. The penis at no time, however, gave the appearance of gangrene and so the sutures were not removed. A catheter was not left in.

The result of these operative procedures in this case was as follows: The boy has perfect control of his bladder at night. Most of the time he has perfect control during the day. When he is tired he is unable to hold the

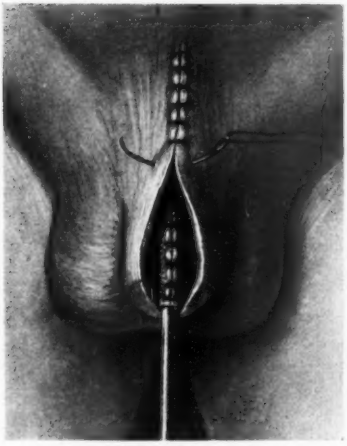

Fig. 489.

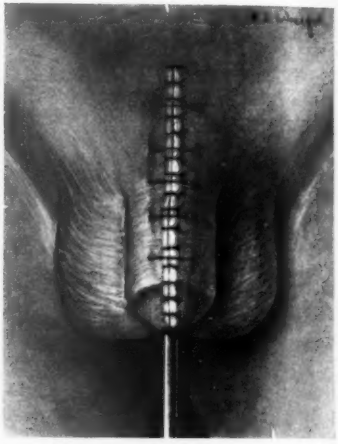

Fig. 490.

urine, but this would average probably one or two days a week. The urethral canal is very well constructed and the urine is passed through it. There is a tiny sinus formation in its midportion, through a drop or two of urine exudes when he urinates. The penis occupies not an absolutely normal position, but practically so. The boy is able to go to school, a thing which before was totally impossible. It is believed that absolute control of urination will be the ultimate outcome.

CLINIC OF DR. GUY COCHRAN

CHILDREN'S HOSPITAL, LOS ANGELES

CONGENITAL HYPERTROPHIC PYLORIC STENOSIS IN INFANTS

HERE is a male baby of the most frequent type. (In our series there have been 5 males to 1 female.) He is four weeks old; birth weight is 7 pounds, 2 ounces; present weight is 7 pounds; is breast fed. He has cried after each feeding since birth, but has been well until three days ago, when he vomited for the first time. Since then he has vomited after each feeding and after taking water, the vomitus being always projectile. The bowels moved four days ago. Since that time only a little mucus followed the use of a suppository. You will notice that the cry of the baby is that of starvation, and that his skin hangs in loose folds from dehydration.

We are unable to palpate a tumor at the pylorus, but this is not unusual, for in many we find at operation that the tumor at the pylorus lies under the border of the liver or is too deep in the abdomen to be felt; therefore a palpable tumor as a symptom is negligible. Since he has been in the hospital, the usual peristaltic wave from left to right has been observed on several occasions.

The pylorospasm cases are usually ruled out after a couple of days' observation, with change of feeding, and by the use of atropin. The *x*-ray has not been of help and has been practically abandoned.

The dehydration of these babies is always marked, and because it is as big a factor as the starvation we endeavor to improve this condition by salt solution into the abdomen or hypodermatoclysis in some form before operation, especially if the child has not lost over 20 per cent. of its weight, for that loss

appears to be the dividing point between those who are good risks and those who are bad.

If the child has lost over 20 per cent. of weight we operate anyway, for though they are bad risks we feel that surgery offers the only chance. We have had so many who are nearly moribund when we get them that it has greatly raised our surgical mortality percentage, but we cannot help that except by educating the doctors to be on the lookout for these cases and get them to surgery earlier. We have operated 105 babies. In the group who have lost less than 20 per cent. body weight our mortality is 3 per cent. as against 35 per cent. in the moribund ones.

On the operating table they are kept warm by hot-water bags about them. Ether has proved the most satisfactory anesthetic, and it is remarkable how much is required for these small babies. Through an upper right rectus incision the pylorus is dragged into the wound by a blunt hook covered with rubber tubing, for every effort is made not to handle the stomach or viscera unnecessarily. This case shows the usual ivory colored tumor at the pylorus. It is about the size of an olive and consists of firm circular muscle-fibers. The Rammstedt technic is followed in all cases.

The tumor is held between the thumb and index-finger of the left hand, being careful to avoid traction, for we have had two deaths by shock following the operation which we believe to be due to dragging on the tumor to get it well into the wound, and thereby shocking the celiac plexus.

A longitudinal incision is made through the most bloodless area of the pylorus. This wound is deepened by blunt dissection by opening and closing a mosquito forceps until the mucosa appears. This spreading is carried out through the entire length of the tumor, for if only a few fibers are left a recurrence follows.

You will notice that at the gastric end there is considerable thickening of the tumor as the result of the edema from the gastric peristalsis, while at the duodenal end the tumor thins out rapidly. This is a danger point, for it is very easy to tear through

the thin duodenal wall and get a leak which means peritonitis later, or a vessel which bleeds freely and cannot be clamped without tearing through the wall of the duodenum. When either of these accidents have occurred, we have thrown a suture over the area to stop this bleeding or close the leak, and begin again with an entirely new incision, for our attempts at repair have not be successful. We have not found it necessary to fill this gap by any plastic endeavor, for there have been no adhesions to this area and the remaining circular fibers quickly melt away. This was not true when we did the old gastro-enterostomy, for in these the bands remained. The abdomen is then filled with salt solution and the abdominal wound closed in the usual manner; however, in bad risks time is frequently saved by making the abdominal closure through and through with silk.

There is nothing in surgery more spectacular than the convalescence of these cases. They usually vomit once or twice after being put to bed. They are given hypodermatoclysis in some form and are kept warm. Feeding is begun with 1 or 2 drams of diluted mother's mild every two hours, which is gradually increased until the baby is in good condition—which is usually within two days—and from then on gains its weight rapidly.

Throughout the entire case each baby is regarded as a feeding case, with surgery as an incident. By this I mean we want the pediatrician's full co-operation all the way.

CLINIC OF DR. L. ELOESSER

SAN FRANCISCO HOSPITAL, STANFORD UNIVERSITY SERVICE

CONGENITAL CYSTIC DISEASE OF THE LUNG

THIS young student of twenty, whom I should like to present to you, was kindly sent to me by Dr. James W. Ward. His father has brought the boy to Dr. Ward about once a year for the last ten years.

There is no lung trouble in the family. The boy had had all the ordinary diseases of childhood—measles, whooping-cough, scarlet fever, and frequent sore throats. Before his present illness he had his tonsils removed; since then he has had no further trouble with his throat. As a child he had a lymphadenitis and lymphangitis of the arm following an injury which laid him up for seven weeks. He recovered from all of these infectious ailments with no difficulty; none of them affected his chest.

In 1917, at the age of nine, he had what was thought to be a pneumonia that lasted six weeks; with it he had a constant cough, but no expectoration. The pneumonia was thought to have been followed by an empyema. Since this illness he has had an attack of fever about every six months. His chest was aspirated periodically and finally was opened by Dr. Ward in 1920, much pus being evacuated. The chest has remained open ever since; he wears a drainage-tube in it. Bismuth paste was injected into the opening a number of years ago; he promptly coughed out the paste.

He is very thin and dyspneic on exertion, but he feels fairly well except for his chest. I first saw him for a short visit on September 12, 1927. He was a lad of about 6 feet, 2 inches in height; he weighed about 110 pounds. The pulse was 60, the blood-pressure 120/80; there was no rise in temperature.

The cervical and axillary glands were moderately enlarged and soft. The skin was of the pale greenish hue of chronic sepsis. The thyroid was about one and one-half times normal size, soft and of uniform consistency.

The chest was flat; the left side was retracted and stood still. It was tympanitic upon percussion. There were no breath-sounds to be heard over it. There was a drainage-tube inserted into a small opening in the tenth rib, at the line of the scapular angle. There was very little secretion from the tube. Air escaped from the drainage opening when he breathed or coughed and a few drops of ether injected into it immediately provoked a cough. The right side of the chest was free; there were no râles at either apex.

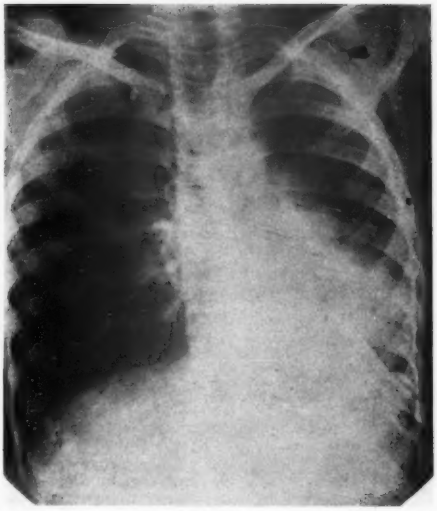

Fig. 491.—August 14, 1922. Marked deviation of the trachea to the left. A large air-containing cavity without fluid, with various strands running through it, corresponding to the left upper lobe. A multilocular cavity below contains a rubber drain introduced through an old resection opening in the tenth rib.

Fig. 492.—October 12, 1927. Lipiodol injection outlines the trachea and main bronchi well. Trachea deviates to left. Large cyst of left upper lobe persists. Lipiodol fills a few sacs in the lower left lobe which would otherwise not be apparent. Drain still in place.

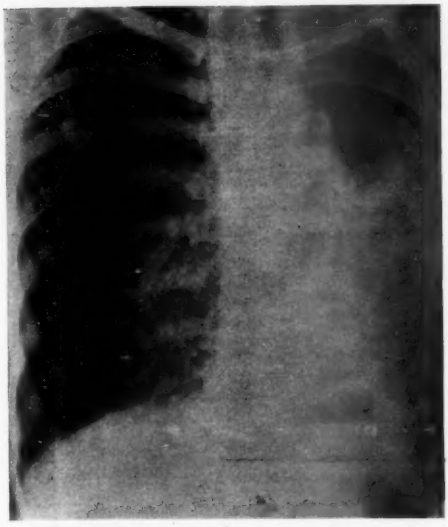

Fig. 493.—December 5, 1927. After first operation. Resection of fifth to tenth ribs, left, inclusive. Upper cyst unchanged. Lower lobe opened and packed with gauze.

Fig. 494.—January 21, 1928. Bronchiectatic cysts of left lower lobe filled with lipiodol which was poured into the open wound.

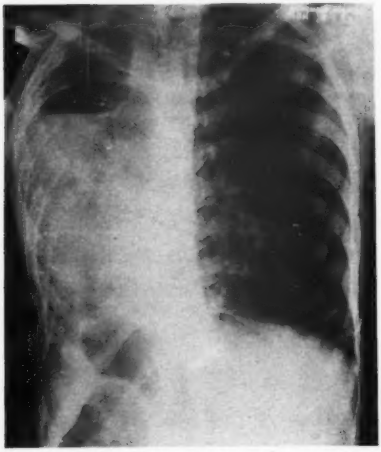

Fig. 495.—February 11, 1928. Cyst of left upper lobe containing fluid. This illustration has been reversed. Right should be left.

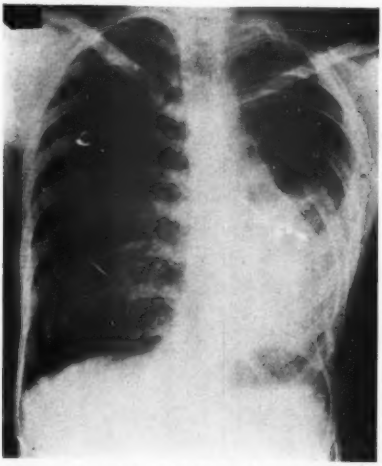

Fig. 496.—March 12, 1928. Lipiodol injection after extirpation of left lower lobe. Main bronchus to left lower lobe ends blindly; left upper cavity again contains air, but no fluid.

The heart was displaced 1 inch to the left of the left nipple line; the right border lay ½ inch to the left of the sternum.

The liver and spleen were not enlarged and not palpable; the rest of the abdomen was normal.

There was no edema.

The urine was normal. The blood-count was as follows: Hemoglobin, 85 per cent. (Sahli); red blood-cells, 5,080,000; white blood-cells, 7800; polymorphonuclears, 68; lymphocytes, 32.

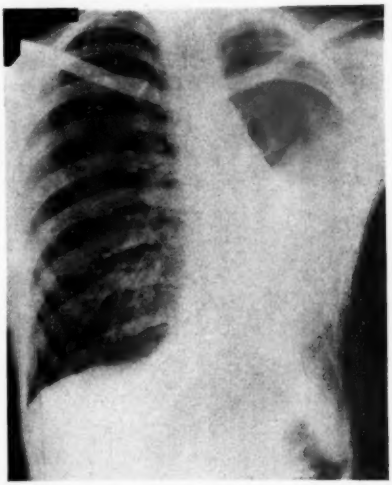

Fig. 497.—May 7, 1928. Left diaphragm and heart are pulled strongly to the left and fill in the space formerly occupied by the lower left lobe. The upper lobe cavity is still empty.

Dr. John Rehfisch reported the *x*-rays as follows:

Chest (October 11, 1927).—Fluoroscopically the left diaphragm cannot be distinctly made out though its dome is more or less well outlined by a gastric air-bubble below. It does not move. The right diaphragm is hyperactive.

Stereoscopic anteroposterior chest films show a very marked collapse of the left lung with a large pneumothorax occupying practically the entire upper half of the left chest. The lower lobe would seem to be not so well collapsed. It is densely atelectatic and the bronchial tree supplying it, which is air-containing, can be well made out below the heart shadow; this is especially well demonstrated when the plates are viewed stereoscopically. A portion of the tenth rib has been removed posteriorly and a drainage-tube is inserted through this bony defect into the lower portion of the left chest just above the diaphragm. There is no fluid present. The heart and mediastinal contents have been displaced toward the left and much of the hilus shadow of the right lung lies behind the vertebral column. The right lung itself

appears normal as far as active pathology is concerned. There is a small calcified nodule at the right top.

Conclusion.—Drainage-tube in left chest with complete collapse of upper left lobe and partial collapse of lower left lobe.

Lipiodol Injection of Chest (October 12, 1927).—Fluoroscopically the lipiodol is seen to be partially obstructed just below the point where the right major bronchus takes origin. A considerable amount of oil drips slowly down past this point and enters a small bilocular puddle with its lower margin at the summit of the dome of the diaphragm. This puddle has a clearly demonstrable connection with two large bronchi and its bronchial relations are beautifully demonstrated in the stereoscopic films.

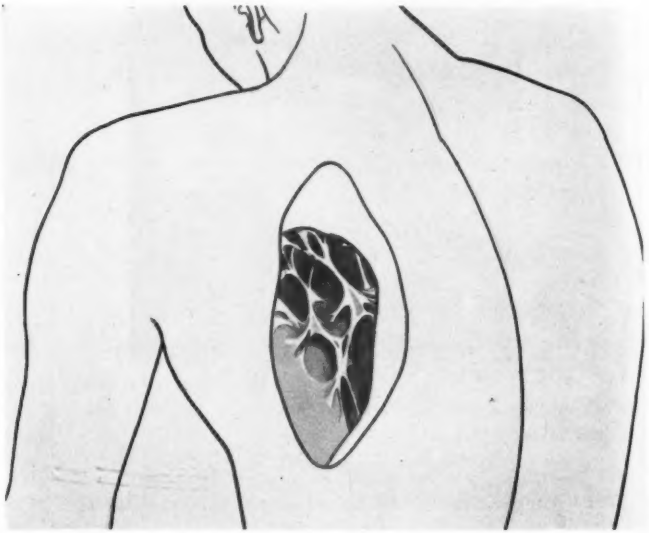

Fig. 498.—Drawn from photograph. Shows polycystic lower lobe after first operation.

The lateral view shows that this bronchiectatic puddle is very near the dorsal border of the right base. When the patient raises his intrathoracic pressure voluntarily the oil is forced upward and out of the drainage-tube.

Conclusion.—Stenosis of the right lower bronchus with peripheral bronchiectatic dilatation in the partially collapsed lower right lobe with a bronchial fistula connecting it to the outside world.

I diagnosed a chronic empyema with a bronchial fistula, and thought it most likely that we had to deal with a congenital

bronchiectasis that had perforated into the chest. I advised an attempt at closure after the manner of Colonel Keller.

I may as well state here that both Dr. Rehfisch and I were mistaken. What we took to be a large pneumothorax cavity was not a pneumothorax, but a huge unilocular cyst of the left upper lobe. The left lower lobe was not collapsed, but consisted of a series of bronchiectatic cysts, and the drainage-tubes lay in one of these cysts and not in the pleural cavity.

On October 20, 1927, under satisfactory gas and local anesthesia, a curved incision was made over the left chest and about 5 or 6 inches of three ribs, including two below the one which had grown around the drainage-tube, and this rib itself, were resected. Upon opening the pleura one entered a sacculated multilocular cavity into whose top an open bronchial mouth debouched. The upper part of the chest, which from the radiographs seemed to consist of one large pneumothorax cavity, was now seen to be closed from the present thoracic opening by the above mentioned sacculated membrane. The pericardium lay at the front of the wound. The soft parts were brought down over the pericardium with one mattress stitch, and the rest of the wound was left open, the sacculated cavity being packed with balsam of Peru gauze. It appeared probable that the cavities were bronchiectatic.

The boy made a good recovery.

On November 7, 1927 my notes read: "The old cavity, exposed at previous operation, is clean and granulating. The pericardium is visible in the bottom of it, and between it and the chest wall lies a trabeculated meshwork into whose pouches various bronchi debouch; touching these bronchi immediately provokes a cough. Access to the upper part of the pleural cavity which radiographically seems to consist of a single large space is not got by this first operation; a needle introduced into the upper chest in two places withdraws air. In order to open the upper part of the chest, therefore, $2\frac{1}{2}$ inches of two more ribs are resected from about the costal angle forward. The underlying parietal pleura is about $\frac{1}{8}$ inch thick; underlying it and clearly separable from it in a cleavage plane is another thin membrane,

perhaps $\frac{1}{32}$ inch thick; when this is entered one looks into a large cavity, occupying the whole upper chest, gray and glistening, its medial surface pierced by numerous openings, the largest perhaps $\frac{1}{8}$ inch across, some of them running as tunnels superficially in and out of the thin membrane, others probably running toward the bronchi. Between this very large cavity and the multiple trabecular ones, opened at the previous operation, lies a thin, but tough, fibrous septum perhaps a little over $\frac{1}{4}$ inch thick, which in its center clearly carries a little spongy lung tissue. This septum runs on to the chest wall and completely separates the newly opened very large upper cavity from the smaller trabecular ones opened at the first operation. *Diagnosis:* Congenital maldevelopment, left lung. Bronchiectasis of lower left lobe and enormous bronchiectasis of left upper."

After about a week the drainage-tube was removed from the large cyst of the upper lobe; the opening closed and no further fluid collected in it. The trabeculæ of the lower lobe shrank in the course of the patient's two months' stay in hospital, leaving exposed the large, shallow, half-opened pouches that represented the open cysts of the left lower lobe. They were lined with a velvety, red, bronchial mucosa. Touching them provoked no cough, but the large lumina leading toward the hilum were extremely sensitive, so that touching them with an instrument sent the patient into fits of coughing. The pouches secreted a clear, thick, viscid mucus.

On January 24, 1928 the sacculated and open lower lobe was dissected off from the pericardium and diaphragm, to which it was attached, partly with a knife, partly with the galvanocautery. A thin layer of alveolar parenchyma surrounded the large pouches. At the end of dissection two large bronchial branches led into the left lower main bronchus. These were cut across, the vessels of the hilum were tied, and the bronchial mouths closed with fine black silk sutures. The soft parts, the skin, and the subcutis were loosened, dropped in over the bronchial stump, and loosely united with silkworm-gut sutures. A transfusion was done on February 7th.

The boy again made a good recovery and on March 12th was

sent home with a small sinus leading to the stump of the left lower main bronchus which still secreted a few cubic centimeters of mucopus a day. Since he has been at home a few black silk sutures have been discharged from the sinus. A lipiodol injection shows it to lead into the left main bronchus. No connection between the large cyst of the left upper lobe and the sinus is demonstrable.

What to do with the large cavity of the upper lobe is a problem. An extensive thoracoplasty will probably collapse it, but it is doubtful whether any operation is justifiable, as the lad has no trouble from the large air-containing cyst.

Isolated congenital cysts of the lung are rare, but a considerable number have been reported. Sultan operated upon a suppurating cyst of the left lung in a twenty-three-year-old girl; she succumbed to a postoperative empyema. Sauerbruch operated upon two: one a woman with a cyst of the right upper lobe who died of postoperative shock; a second patient with a left-sided cyst was cured.

Cystic degeneration of an entire lobe is also reported: Clairmont (Deutsche Zft. f. Chir., 200, 157) operated upon a boy of ten with a cystic degeneration of the right middle lobe; the boy died of postoperative shock or embolism. Sauerbruch (Arch. f. Klin. Chir., 148, 721), in a short communication to the 1927 meeting of the German Surgical Society, speaks of 4 patients sent to his clinic for treatment of what was taken to be chronic empyema. The chests of the first two were collapsed by the usual methods, when, to his surprise, he found that what was taken to be an empyema consisted, in reality, of large cystic pulmonary cavities. Fortified by this experience he was able to make a correct diagnosis in the other two. All 4 patients were cured after extirpation or resection of the diseased lobe.

Robert T. Miller, Jr. (Arch. of Surg., 12, 392) reports most interestingly upon 2 infants, one with a congenital cystic lung exactly similar to this patient's, except that in the infant the right lung was affected. A child of five weeks was brought to the Johns Hopkins Hospital suffering from attacks of dyspnea, cyanosis, and labored breathing, coming on usually twice a

day, and lasting from fifteen to thirty minutes, during which the child "fought for breath." *x*-Ray films were reproduced that Miller interpreted as a complete pneumothorax of the right side, considering that a spontaneous rupture of the cystic lung into the pleural space had occurred. A needle inserted into the chest released air under high pressure; the mediastinum, which was driven far over to the left, returned to the midline and the child's attack was immediately cut short. After repeated recurrences, relieved by repeated punctures, a tube fitted with a one-way valve was introduced which gave complete relief as long as it was in place. It was removed at the end of a week and the child was discharged with its heart in normal position, with a partially expanded right lung, and with breath-sounds coming through at the base, although with a somewhat tympanitic percussion note over the right half of the chest. At the age of five months the attacks of extreme dyspnea and cyanosis again returned and it finally died in an attack. No necropsy was done.

Reviewing this report in the light of the experience gathered from the patient we have under consideration, it seems to me that there is no evidence that a rupture of the lung with a consequent pneumothorax occurred in Miller's baby. There was certainly no pneumothorax in Meyer's case, cited by Miller in his paper, with exactly similar symptoms. A cystic dilatation with partial bronchial stenosis, admitting air more freely during inspiration than it allowed it to escape during expiration, would lead to the same positive intrathoracic pressure. It is likely also that this valve-like obstruction might be a part of the process which led to cystic degeneration of the lung. Furthermore, I think that an interlobar septum, running from the midline to the chest wall, is distinguishable in both Figure 2 and, less clearly, in Figure 3 of Miller's paper, which obviously would not appear were the lung collapsed. I think it likely, therefore, that it was the distended cystic lung and not a pneumothorax that drove the mediastinal contents to the left, and that Miller's needle and his tube entered the lung itself and not the pleura, and that the tube might have remained in place without fear of causing an empyema.

The second child died on the twelfth day of life of similar at-

tacks of dyspnea and cyanosis. The plate of the lung shows multiple smaller cysts, like those of a polycystic kidney, with large areas of sound lung in between them.

Sauerbruch thinks that congenital cystic degeneration may be caused in an early stage of development by a duct of Cuvier which, stretching unusually sharply across the hilum of the embryonal lung-bud, constricts it and presses upon it. The preponderance of left-sided bronchiectatic anomalies is explained by the relation between the right and left ducts of Cuvier. The left lies lower, the heart compresses the left lung more sharply against the duct. Meyer's plate (reproduced in Miller's paper) seems to corroborate this theory.

Diagnosis of congenital cystic lungs is difficult, often impossible. When a communication with a bronchus exists an *x*-ray with lipiodol will prove that the oil lies in the lung and not in the pleura, and that we are dealing with a cyst and not a pneumothorax. If the cyst contains air, but does not demonstrably communicate with the bronchus, then the presence in the films of a shadow corresponding to an interlobar septum will reveal the facts, for if one had to do with a pneumothorax and a greatly collapsed lung the interlobar septum would also be collapsed. Such a shadow is visible both in Miller's films and in my own.

If one has to deal with a solitary cyst or a single cystic lobe, filled not with air but with fluid or pus, the diagnosis is still more difficult. Clairmont's patient was thought at first to have an interlobar empyema, yet, as Clairmont remarks, the shadow was a rectangular one, running squarely across the chest; whereas, the shadow of an interlobar collection is more often wedge shaped with its base toward the lateral chest wall.

Other cysts are to be considered. An echinococcus cyst may give rise to urticaria, shows the typical echinococcic complement-fixation, and the fluid, if one dares aspirate it, may contain scolices and be watery and clear. Radiographically there is likely to be seen a zone of normal lung in the lobe containing the cyst. A dermoid cyst may reveal teeth or bones, strongly radiopaque shadows. An old encapsulated tuberculous empyema may show

signs of tuberculosis elsewhere; radiographically it may be indistinguishable, these cysts, of course, contain fluid but no air.

The terrifying recurrent attacks described by Miller, Meyer, and others, in which an infant fights for breath, turns blue, wheezes, whistles, and chokes, and finally dies in an attack are characteristic. They are due to increased air-pressure in a partially obstructed cyst. The same attacks, however, will accompany a pressure-pneumothorax, from which the presence of an interlobar septum, radiographically demonstrable, will distinguish them. If the cyst communicates either perfectly freely or not at all with the bronchus then these attacks are absent, and in the both instances the symptoms will be quite uncharacteristic. With a free communication the symptoms and signs will be those of a wide open internal pneumothorax; with no communication at all the cyst, usually a smaller one, contains a mucous secretion and makes the varied symptoms of a benign intrathoracic tumor or of an intrathoracic abscess, or perhaps no symptoms at all.

The signs are those of a pneumothorax, with or without pressure and mediastinal deviation if the cyst is open; or of an intrathoracic tumor, an empyema or an abscess if it is closed. Accordingly as the cysts are sterile or not the patients are free of fever or feverish and toxic.

There is often a cough with little or no sputum.

In infants with signs of raised intrathoracic tension and mediastinal deviation the cyst should be opened, either by the introduction of a valve-tube or by marsupialization, sewing the lining of the cyst to the skin of the chest. I doubt whether anyone would undertake lobectomy in infants of so tender an age. In older patients wide opening of the cystic lung with subsequent more or less complete removal of the lobe and suture of the communicating bronchus is indicated. Dissection of the cyst is not easy; adhesions, especially diaphragmatic ones, are firm and need be cautiously severed, especially as one approaches the hilum the vessels are large and require accurate and sure hemostasis. However, dissection may be interrupted at any time; the partially freed lobe may be packed about with gauze or part of it

may be cut away and the operation completed at another sitting, or at several. The galvanocautery lends itself well to dissection; the operation is less bloody than with a knife. It is well not to attempt a total lobectomy, but to leave a little lung tissue about the hilum to cover the bronchial stumps, which should be closed with a series of fine silk sutures.

Large uninfected cysts without pressure symptoms may be left untreated.

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PREVENTION OF RECURRENT GOITER

SINCE Kocher began his work with goiter, there has been a continuous discussion as to the efficiency of different methods of treatment, especially as to the relative value of operative and medical treatment. At first the mortality rate was such that the danger of the operation was an important factor in the discussion. But today, with the use of Lugol's solution in preparing the patient for operation and the greatly improved technic, the mortality rate in the hands of a skilled goiter surgeon is very low, in fact, it is less than the mortality rate from cardiac disease due to toxic goiter in those who are not operated upon. The internists, for the most part, no longer treat toxic goiter with the idea of a cure, but merely for the purpose of preparing the patient before referring him to the surgeon. The *x*-ray treatment has had its days and is no longer used except by *x*-ray enthusiasts and a few general practitioners. The question of the prevention of goiter with the exception of the congenital form is pretty well understood.

Formerly most of the goiter operations were done by surgeons especially interested in goiter who had, because of this interest, developed such ability that they might be referred to as goiter surgeons. With the increase in the interest in goiter, general surgeons and general practitioners began operating upon goiters, so that today the most of the goiter operations are not being done by the specially trained goiter surgeons. As a result, there has been, at least in our clinic, a considerable increase in the number of patients coming in with recurrences following operation. I see as many now in one year as I formerly saw in two or three years.

These recurrences we group roughly into four classes: First, errors in diagnosis; second, patients operated upon after permanent lesions have been produced; third, incomplete operations; and fourth, true recurrences.

First group. A patient whom I saw yesterday will illustrate this group.

The patient was a woman thirty-two years of age, American and married. Family history: Father died of pneumonia. Mother living, has a goiter. Two children living. Husband well. No history of cancer or tuberculosis in family. Previous illnesses: Ruptured appendix six years ago and tubal pregnancy two years ago.

Present complaint: (1) Tachycardia and palpitation of heart; (2) nervousness; (3) loss of weight; (4) swelling of feet; (5) constipation.

Present illness: Began feeling badly three and one-half months ago. Tachycardia and palpitation noticed for two months. Has lost some weight but does not know how much. Appetite good. On direct question during examination, stated there was a slight cough but did not mention this among list of complaints.

Examination: Pulse 96, regular. Temperature 98.6° F. Blood-pressure 124/88. Tonsils contained caseous material. Thyroid palpable and lies low. Roentgen-ray picture of chest revealed early evidence of tuberculosis.

Now here is a patient who has tachycardia, palpitation, nervousness, and tremor; she has lost some weight and has a goiter. She was referred to me under a diagnosis of toxic goiter. Her physician does not operate. Had she consulted one who did, she might have been operated upon. If this patient were to be operated upon, she would feel better and show actual improvement because of the rest in bed, but in a short time all of her symptoms would return, and until the pulmonary lesion had been diagnosed she would have been regarded as having a recurrence. Any low-grade infection may produce symptoms simulating early hyperthyroidism.

The second type of so-called recurrences are those in which the patients have been operated upon after permanent lesions have been produced consequently, although the goiter may be cured by the operation, the patient will still have the evidence of goiter in the damaged heart and the damaged nervous system.

The third group, that due to incomplete operation, is the group that is increasing today. The operation for goiter is not as simple as it looks. I am frequently asked how much of the thyroid gland should be removed in the different types of goiter. In my judgment there is only one reply: Remove all except a thin layer along the posterior capsule. Leave the same amount of thyroid in all types of goiter regardless of whether it belongs to the extreme colloid form of the diffuse adenomatous type or the very toxic exophthalmic type. Our rule is to remove practically all of the gland, leaving only enough of each lobe to permit regeneration. If a sufficient amount of the diseased gland is left to secrete thyroxin enough to care for the needs of the patient the patient is very apt to have a continuation of the goiter because the gland left is still a diseased gland. We remove so much of the gland that the patient would have hypothyroidism or even myxedema if there were no regeneration. There is no gland in the body in which regeneration takes place more easily and more readily than it does in the thyroid gland. Were it not for this, goiter would not be nearly so common. Exophthalmic goiter is an excessive hyperplasia of the epithelial cells lining the acini; adenoma is an excessive localized hyperplasia of acini; and the diffuse adenomatous goiter an excessive diffuse hyperplasia of acini, all due to the great regenerative power of the thyroid gland. I have studied the ability of regeneration upon rabbits and dogs. In both of these animals I found that when enough thyroid was left to supply the needs of the animal, no regeneration took place, but when so much of the gland was removed that there could not be enough thyroxin supplied, there was an increase in the amount of colloid secreted within two days, and within a week hyperplasia began. This hyperplasia was rapid, so that in from three to four weeks it was entirely completed. The problem in operating upon the goiter patient is not one of leaving gland enough to meet the needs of the patient, but one of leaving gland enough to secure regeneration. This amount, we found in our experimental work, is exceedingly small.

The first two patients we have to operate upon this morning are those with pseudorecurrences.

The first patient is a woman, age forty-one years, and married.

Complaint: (1) Goiter; (2) tachycardia and palpitation; (3) tremor; (4) loss of weight; (5) nervousness; (6) increased warmth; (7) tires easily.

Present illness: Patient was operated upon for toxic goiter twelve years ago after an illness of one year. Following operation, felt well for two or three years, but the heart-beat was never normal and rarely under 100. She noted definite progression of symptoms about two years ago and more marked the past six months. Lost 12 pounds in weight, although appetite has increased.

Examination: Patient presents the typical appearance of exophthalmic goiter. Pulse 100; temperature 99° F.; blood-pressure 226/100. Mild exophthalmos present. Thyroid: Right lobe enlarged to grade 2; left lobe palpable. Gland is firm. Heart: Apex-beat heaving in type, transmitted to entire anterior chest wall. Second aortic greater than second pulmonic. Abdominal aorta palpable and beat forceful. Tremor, grade 4. Basal metabolic rate, +101.

This patient was sent to the hospital and put at absolute rest in bed, 10 grains of veronal was given each evening and 5 grains each morning for the first few days. She was given 25 minims of Lugol's solution four times daily. Diet was forced. Today, instead of having a nervous apprehensive patient, we have one who has been begging to be operated upon. We never "steal" a goiter. We do not operate until the patient is mentally ready for the operation, and the most of them are not nervous upon coming to the operating room. At the former operation only a portion of one lobe was removed. She now has an enlargement of the other lobe and the isthmus. In times past we have seen many recurrences of this type. As this type of operation is no longer done, we are now seeing only those in whom recurrence has been delayed because recurrence in true exophthalmic goiter in which only one lobe has been removed is the rule and not the exception. In operating upon this patient the scar will first be removed, and then the operation will not differ from our usual operation except that there is only one lobe and isthmus to remove.

The next patient belongs to this same group of pseudorecurrences who never had a period of relief. The patient is a

man forty years of age with a toxic, hyperplastic (exophthalmic) goiter. Although he has been operated upon twice elsewhere he still has a goiter because the operations have both been incomplete. This patient has retrotracheal extensions on each side. This is the most common cause of incomplete operations in the hands of the better surgeons, and yet they are easy to find, both before and at operation, if one is on the lookout for them.

The method of examination is important. In palpating a thyroid gland I prefer to stand behind the seated patient. The tip of the forefinger of the right hand is placed over the upper pole of the right lobe, the middle finger at the center, and the ring-finger over the lower pole, or if this is low at the upper border of the clavicle. The left hand is similarly placed on the left side. The lobes are then palpated with the three fingers on each side. The patient is asked to swallow, at which time the ring-finger is dipped below the lower pole except in those patients where the gland lies so low it cannot be lifted high enough by swallowing.

Next, still standing behind the patient, the fore- and middle-finger of the left hand are pressed against the center of the outer border of the left lobe at a point posterior to the trachea so as to rotate the right lobe outward and forward. At the same time the right lobe is palpated between the thumb and first two fingers of the right hand. The process is then reversed to examine the left lobe. If there are retrotracheal extensions they are rotated outward and can then be palpated. Examination of this patient by this method showed definite retrotracheal masses on both sides. The incision is made along the old scar, and the muscles separated along the midline. Sometimes the ribbon muscles have to be cut in secondary operations, but usually a good exposure may be had without; as the location of the recurrent laryngeal nerve is uncertain because of the adhesions from the two former operations the right lobe will be grasped with the vulsellum forceps well out from the trachea. By lifting forward and turning the forceps inward a fairly large retrotracheal extension is found which has never been touched. This is the cause of the failure of the two previous operations. We will now make a longitudinal

incision some little distance from the trachea through the capsule, and then, with my forefinger behind the retrotracheal extension, forcing it forward, I will remove the gland from within the capsule by cutting close to it and leaving only a thin layer of gland on the capsule. In this way I will not injure the nerve with the knife. Forceps must be so placed on bleeders that they will not touch the capsule, for in so doing the nerve may be pinched. The removal of the retrotracheal extension is not difficult when done in this manner. Securing complete hemostasis is more difficult because of danger to the nerve. We use only fine Kelly forceps and pick up just as little thyroid tissue as possible. The suture in closing the capsule must be placed with great care, or the nerve will be included in a suture and compressed. On the left side the same condition exists and will be treated in the same manner.

The next patient is a woman thirty-six years of age with a true recurrence of exophthalmic goiter. I operated upon her five years ago. She was not given iodin either before or after the operation. She now comes in complaining of loss of weight and strength, nervousness, tachycardia, and palpitation. She has a definite enlargement of both lobes, more marked on the right than on the left. Pulse 144, blood-pressure 140/70, and a basal metabolic rate of +74. This patient has a true recurrence.

In the animal experimental work we took up this problem, and found that in dogs when we removed practically all of the thyroid and did not give iodin the regenerative process was more pronounced than in the animals receiving iodin. In the animals receiving iodin the process is completed in from three to four weeks, while in those not receiving iodin it continues for a longer time. In two of the animals not receiving iodin, either preoperative or postoperative, goiters developed, and in one of these the picture was that of a definite cellular type. In our experimental work we proved that iodin has a definite influence upon regenerative hyperplasia. We are now using iodin for this purpose in the human. The thyroid glands are all saturated with iodin at the time of operation and kept saturated after the

operation for two months by giving 10 minims of Lugol's solution three times daily for the first month and then once daily for the second. After the second month all patients are instructed to take either one 10-mm. iodin tablet weekly or use iodized salt for both table and cooking use. I think this will prevent most of the recurrences.

I have selected the fourth patient to illustrate the type of operation we do for the purpose of preventing recurrence.

The patient is a female, white, age forty years, divorced.

Family history is negative.

Complaint: (1) Goiter; (2) tachycardia and palpitation; (3) nervousness; (4) difficulty in breathing.

Present illness: The goiter was first noticed at sixteen. Following this it decreased in size and then remained stationary until she was thirty-six. Since that time it has been gradually increasing in size. Nervousness began at about the time the thyroid began to increase in size. She has had tachycardia for past two years and difficulty in breathing for the past two months.

Examination: Fairly well nourished. Pulse at rest, 80. Temperature, 98° F. Blood-pressure, 124/82. No exophthalmos. Thyroid enlarged, grade 3, moderate consistency. Heart: Systolic murmur at apex. Small umbilical hernia. Gall-bladder tender. Uterus retroverted and slightly enlarged. Small cystocele and rectocele. Reflexes normal. Slight tremor. Basal metabolic rate +7.

Diagnosis: Diffuse adenomatous goiter producing mechanical symptoms which have been toxic at times but not toxic at present.

Operation advised because of mechanical symptoms. This type of goiter usually becomes toxic in time and it is better to operate before they become toxic and produce permanent lesions.

In the operation note (Fig. 499) that I make only a comparatively short incision. By the use of the Farr retractors this incision will stretch to give ample room. A woman does not like a scar that reaches one-third of the way around her neck and it is absolutely unnecessary. Next, we separate the skin from the platysma to the prominence of the larynx above and for about $2\frac{1}{2}$ cm. below the incision, and at each angle. This separation especially at the ends of the incision is absolutely essential in the use of the small incision. It is best done by blunt dissection with the Mayo scissors (Fig. 500). If a knife is used troublesome bleeding is often experienced. The Farr retractor is placed so as to stretch the incision vertically (Fig. 501). The muscles are

Fig. 499.—Note the relatively short incision.

Fig. 500.—The skin is separated from the platysma by blunt dissection. Above it should be separated to the prominence of the larynx; below, for 2½ cm. It is absolutely essential that both ends of the wound be freed.

then separated longitudinally in the midline (Fig. 502). We rarely cut the ribbon muscles. By using the spring retractors with teeth (Fig. 503) an adequate exposure may be had. The

Fig. 501.—No. 3 Farr retractors are used to stretch the wound in a vertical direction. The spring of the retractor stretches the skin so as to give ample room.

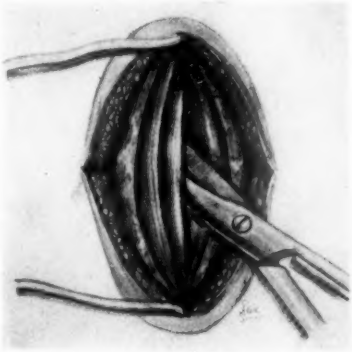


Fig. 502.—The muscles are separated in the midline.

lobe is next seized with vulsellum forceps and lifted out of its bed, while forceps are applied to vessels about the gland.

The method of ligating the upper pole is important. With

gentle traction the upper pole is pulled outward at the same time that the second assistant pulls the muscles backward (Fig. 504). In this manner the upper pole can be reached and dis-

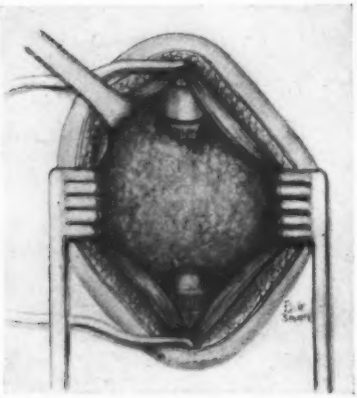


Fig. 503.—The Farr spring retractors with teeth stretch the muscles so that it is unnecessary to cut them. A small retractor pulls the muscles back over the upper pole.

Fig. 504.—The lobe is lifted out of its bed with vulsellum forceps and the large vessels on the outside and at the lower pole clamped.

sected free by blunt dissection. The nose of the forceps is then placed against the inner surface of the upper pole and passed from within outward, hugging the posterior surface of the pole tightly at all times (Fig. 505). It must never be passed in the opposite direction. The forceps is then opened and the lower blade of a second forceps is seized. With the second forceps opened it is pulled back so that the lower blade is posterior to the pole and the upper blade is anterior. The second forceps is

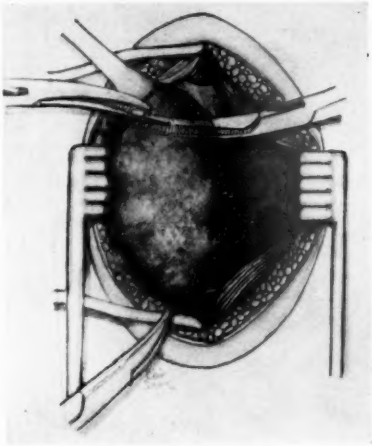


Fig. 505.—After dissecting the upper pole free a curved hemostat is passed under the gland from within outward, the nose of the forceps hugging the gland. The forceps is then opened and the posterior blade of a second forceps seized and drawn inward in such a manner that the posterior blade of the second forceps is posterior to the pole and the anterior blade anterior to the pole. The second forceps is then pushed to the tip of the pole and clamped. While this is being done the lobe is held forward with vulsellum forceps. (These not shown, as they would obstruct vision.)

then pushed upward to nearly the tip of the pole and clamped. The upper pole above the forceps is then crushed and ligated (Fig. 506), following which the anterior portion of the capsule is cut below the first forceps permitting the gland to escape (Fig. 507). The posterior portion of the capsule is not cut. The suspensory ligament is next freed (Fig. 508). The isthmus is then

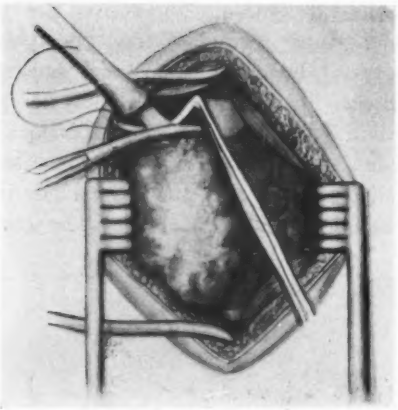


Fig. 506.—The upper pole is next crushed with another pair of forceps and ligated. No thyroid tissue should be left at the upper pole, as regeneration at this point produces an undesirable mass. (Vulsellum forceps not shown.)

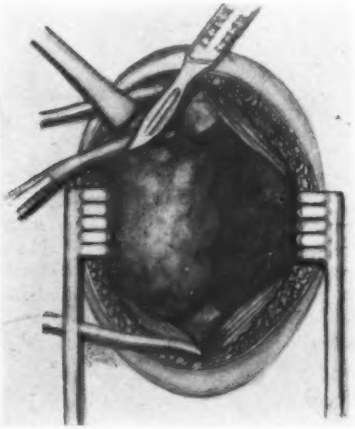


Fig. 507.—The anterior portion of the capsule is cut, allowing the pole to escape forward. The posterior portion of the capsule is not cut. (Vulsellum forceps are in place as in Fig. 504, but are not shown in this illustration as they would obstruct the view.)

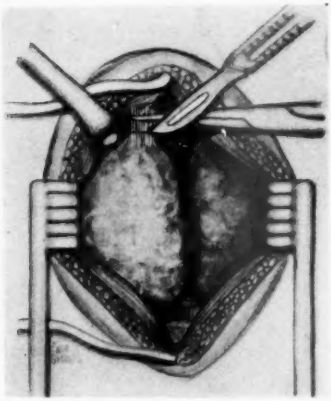


Fig. 508.—The suspensory ligament of the thyroid is next clamped and cut. This is essential for a complete operation through a small incision. (Vulsellum forceps not shown.)

Fig. 509.—The isthmus is raised from the trachea by carefully passing a curved forceps or scissors with dull points from below upward. The forceps must be directed by a finger above the isthmus in order to protect the trachea. The posterior blade of a second forceps is then passed along the first forceps posterior to the gland and the forceps then clamped.

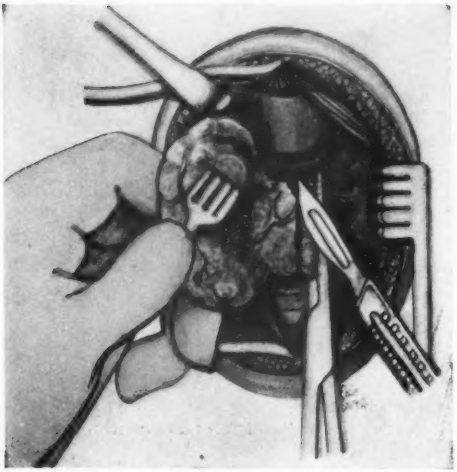


Fig. 510.—The isthmus is cut entirely through. It is essential that no portion of the isthmus be left, not even its posterior capsule, in order to prevent: (1) unsightly regeneration; (2) sense of constriction.

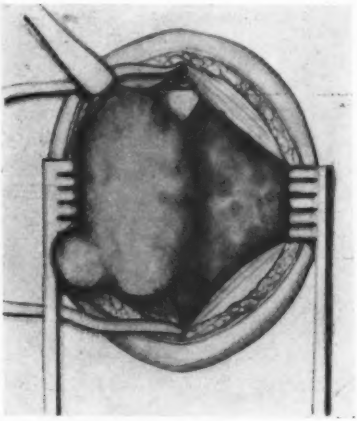


Fig. 511.—The lobe is rotated toward the midline by lifting forward on the vulsellum forceps and at the same time turning then across the midline. This brings out a retrotracheal extension if present. (Vulsellum forceps not shown because obstructing vision.)

raised by carefully passing a curved forceps under it from below upward (Fig. 509). This forceps must be directed by a finger above the isthmus, as otherwise there is danger of injuring the trachea. The isthmus is then clamped and cut entirely through (Fig. 510). It is essential to completely remove the isthmus, leaving the trachea bare because, first, regeneration in this area is apt to give a mass to which patients object and, secondly, retraction of scar tissue on the sides of the trachea may exert sufficient traction on the posterior portion of the capsule of the isthmus, if left, to produce a feeling of constriction.

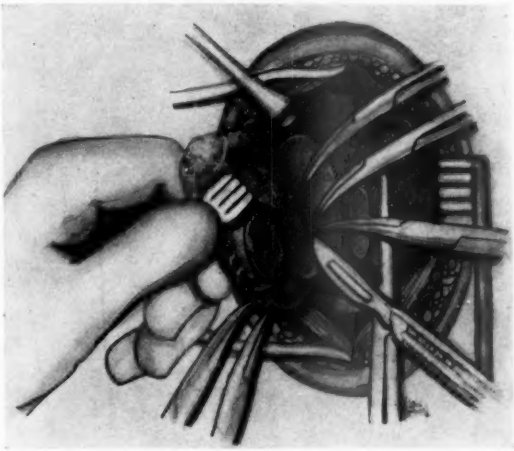


Fig. 512.—The isthmus is lifted forward and an incision made into the capsule just posterior to the isthmus. If made farther posterior the nerve might be injured.

Before starting to remove the lobe it is rotated inward so as to look for a retrotracheal extension (Fig. 511). The failure to do this is a frequent cause of recurrence. The isthmus is now lifted upward and an incision made into the capsule just below the isthmus (Fig. 512). By sharp dissection the gland is then removed, leaving only a very thin layer over the posterior portion of the capsule (Fig. 513). Care must be taken in placing forceps as the recurrent laryngeal nerve often lies close to the

capsule. Dr. Lester Jones, one of my associates, in a dissection, once found it lying in a groove in the capsule. For ligating we use very fine catgut as suggested by Terry. The capsule is next

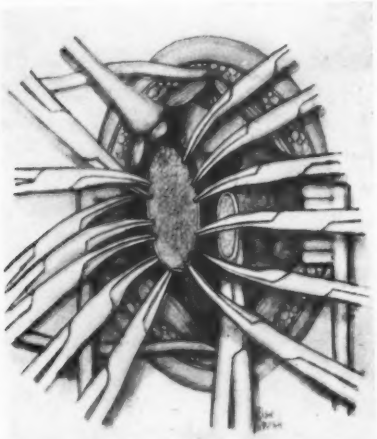


Fig. 513.—The gland is removed by sharp dissection, leaving only a very thin layer of thyroid adherent to the capsule. A sufficient amount of the external capsule is left to cover the raw surface. Forceps must be placed with care.

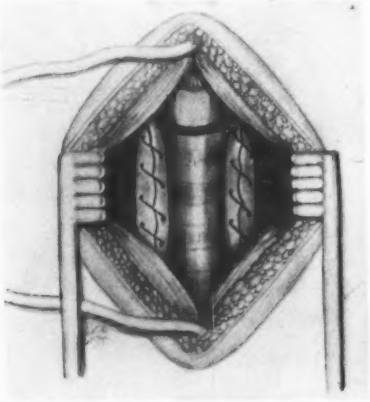


Fig. 514.—The capsule is sutured as accurately as possible over the raw surface so as to prevent oozing.

sutured as accurately as possible so as to cover the raw surface of the gland (Fig. 514). This is essential in the prevention of oozing, as the oozing that is so frequent probably is chiefly from the gland substance. When there is a pyramidal lobe present it must be completely removed, otherwise an unsightly mass may develop. I once saw the return of symptoms from such a recurrence.

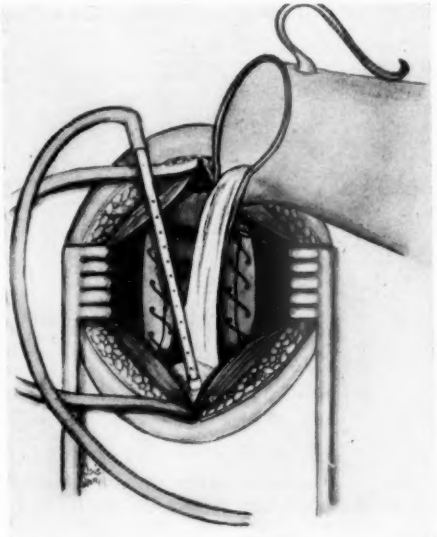


Fig. 515.—The wound is washed out and the water removed by suction so as to remove clots not otherwise found.

After finishing the removal of the gland the wound should be carefully washed out, and the fluid removed by suction (Fig. 515), as in this way many clots are picked up which would otherwise be left and would serve to cause oozing. The anesthetist now lets the patient come out sufficiently to gag. If there are any vessels which have not been properly closed this will open them up. This is very essential in preventing postoperative bleeding and oozing.

The muscles are closed in two layers (Fig. 516) in order to prevent tracheal tug upon the skin. By closing the muscles in this manner there can be no direct line along which serum can drain from the vicinity of the trachea to the skin, and along which a connective-tissue band could form and cause an unpleasant lifting of the skin every time the patient swallows.

Now I want to show you one of the most important steps in the operation from the standpoint of cosmetic results. Visiting surgeons usually get up to go when we start to close, and yet

Fig. 516.—The muscle is closed in two layers so as to prevent the development of adhesions between the skin and the trachea.

women judge the results of the operation in later years more by the appearance of the scar than by the relief of the symptoms which they have forgotten.

Formerly we had a certain percentage who had thick scars develop after leaving the hospital. We would discharge the patients with very pretty thin lines at the site of the incision to have some of them return later with thick raised red scars. I think we have found the cause. We were uniting the epithelium and not the subcutaneous tissue. The entire load was thrown upon the epithelium which underwent massive hyperplasia in order to be strong enough to carry the work that the subcutaneous tissue

should have been carrying. We now use a subcutaneous stitch to unite the subcutaneous tissue (Fig. 517) and then put on skin-clips. It would not be necessary to put on skin-clips in order to secure union, but we get better looking scars by doing it.

You noticed I did not put in a drain. I rarely do. We have been studying the question of oozing. When I used drains oozing was present in 100 per cent. and I was afraid to discontinue it, and then I discovered that the oozing that gives us trouble was not the oozing that was carried off by the drain.

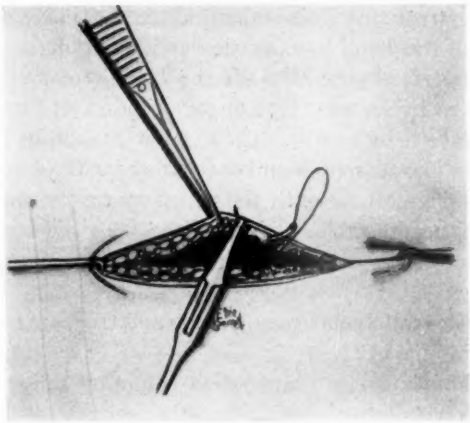


Fig. 517.—A subcutaneous catgut stitch is placed in order to insure union of the subcutaneous tissue. Failure of the subcutaneous tissue to unite necessitates an excessive hyperplasia of the epithelium in order to carry the load. This gives an unsightly scar.

The drain removes blood from vessels that should have been ligated and serum that exudes because of the irritation from the drain which acts as a foreign body. The oozing that gives trouble starts usually between the third and fifth day and comes from the gland. Since discontinuing the drain and being more careful to secure complete hemostasis, we have reduced oozing to less than 50 per cent. When oozing is present it is removed daily with a large needle on a Luer syringe.

The anesthetic used was ethylene. We do not use local

anesthesia because, first, the patient who is the least bit apprehensive is more apt to suffer shock if awake than asleep; and, secondly, oozing is more frequent with a local than with a general anesthetic. Ethylene is safe. Our anesthetist, Miss Isakson, is especially trained for using ethylene. She keeps a continuous chart of the systolic and diastolic blood-pressure, pulse, and respiration where I can see it at a glance.

The after-treatment of these patients is as important in preventing recurrence as is the operation. Immediately upon returning to the bed from 15 to 25 minims of Lugol's solution will be given by rectum. This is done so that if I have drained the iodin out of the gland by operation and manipulation, more will be taken to it at once through the blood-stream. The iodin will be given by rectum three or four times a day until the patient can take it by mouth. Then 10 minims will be given three times a day for one month and once a day for the second month. Following the second month the necessary amount of iodin will be given either by tablet or in the food. This is not medicine. It is a part of the diet. Without it recurrence is apt to take place.

Conclusions.—Recurrences, pseudo and true, are for the most part preventable by:

1. Making a careful examination before operation, excluding those cases with other lesions simulating goiter.

2. Early operation before permanent lesions have been produced.

3. Complete operation, leaving only a very thin layer adherent to the posterior capsule and looking carefully for retrotracheal extensions and removing pyramidal lobes.

4. Having the thyroid saturated with iodin at the time of the operation and keeping it saturated for two months after the operation and thereafter maintaining the proper intake.

CLINIC OF DR. FRANK HINMAN

UNIVERSITY OF CALIFORNIA HOSPITAL

THE SURGICAL TREATMENT OF UROGENITAL TUBERCULOSIS

THERE are two distinct problems in genito-urinary tuberculosis that are not appreciated by the medical profession in general. The first concerns renal tuberculosis, and the second, genital tuberculosis, but in practice the two, for purposes of proper treatment and cure, need to be jointly considered. The prominent characteristics of tuberculosis of the genito-urinary tract are also insufficiently realized. The frequency is much greater than one would think unless statistics are studied, and the general morbidity is far in excess of the usual superficial estimation. Genito-urinary tuberculosis not treated surgically has, in fact, a higher death-rate than pulmonary involvement. It is for this reason that the third characteristic of tuberculosis of the genito-urinary tract should be universally recognized, namely, that, whether primarily renal or genital, the condition, with few exceptions, constitutes a surgical problem.

Briefly, the facts known at present concerning renal and genital tuberculosis are these:

I. RENAL TUBERCULOSIS

The **incidence of renal tuberculosis** is best studied from autopsy statistics together with clinical results. Autopsy records show primary renal tuberculosis to be present in from 1 to 5 per cent. of cases according to the particular series studied. When there is an active tuberculous lesion other than the urinary tract, such as in the lungs, joints, etc., this incidence of renal tuberculosis increases to between 10 and 20 per cent. Clinical statistics reveal that renal tuberculosis accounts for between 30 and 35 per

cent. of the cases of total nephrectomy, placing the prevalence of this condition above other urologic diseases.

Clinical evidence bears out the fact that, except in the cases of miliary infection, renal tuberculosis is unilateral in its origin. Although autopsy records show the condition to be unilateral in 52 per cent. and bilateral in 48 per cent., clinical records show the ratio to be 86 per cent. unilateral to 14 per cent. bilateral. Taking into consideration the wide variety of clinical errors experienced in the diagnosis of this condition this ratio seems to be a fairly accurate estimate.

Clinically, the cases of renal tuberculosis fall into two groups: (1) Those in which the renal involvement is primary in the kidney with no evidence of tuberculosis elsewhere; and (2) those in which it is secondary and is accompanied by active tuberculosis elsewhere. From a strictly pathologic standpoint this division does not exist inasmuch as all infections of the kidney with tubercle bacilli are probably secondary to a tuberculous focus elsewhere which may have healed or be so masked as to leave no clinical evidence of its existence. Clinically, between 60 and 70 per cent. of the cases of renal tuberculosis fall in the primary group. It is for these patients that surgery becomes so efficient. Of the secondary group of 30 to 40 per cent., those with active tuberculosis elsewhere, there are 10 to 15 per cent. with pulmonary involvement and 50 to 60 per cent. with an associated genital involvement. The bladder is involved in between 25 and 50 per cent. of all renal cases. Our own group of cases showed 75 per cent. of the patients to have cystoscopic evidence of vesical involvement.

Genito-urinary tuberculosis attacks individuals in the prime of life—85 per cent. of cases occurring between twenty and fifty years of age. This alone gives an index of the economic importance of early treatment.

The **earliest symptoms of renal tuberculosis** originate from the bladder, the patients seeking relief because of the burning and frequency on urination. Hematuria is the next common complaint. Pyuria due to genito-urinary tuberculosis is generally characterized by the absence of the common pyogenic

organisms and the fact that bacteriologic cultivation ordinarily gives negative results, inasmuch as the tubercle bacillus will not grow on ordinary culture-media. It is the exception to find secondary infections with pyogenic organisms. In early cases it is rare to find patients complaining of backache of renal origin or to show general evidence of tuberculosis, such as fever, malaise, loss of strength, and weight. The majority of these patients are well nourished and in their full vigor.

The Treatment of Renal Tuberculosis.—It is the universal belief that early nephrectomy is the method of choice in all cases in which unilateral tuberculosis is found clinically. The exceptional cases in which spontaneous healing has occurred have shown at autopsy to be invariably due to a complete destruction of the renal parenchyma—the so-called autonephrectomy.

It is difficult to form an accurate estimate of the results of nephrectomy for renal tuberculosis. The refinements of diagnosis and technic have made a wide variation of figures. In a series of cases recently reviewed the surgical mortality prior to 1910 was more than 18 per cent. as compared to 4.4 per cent. since 1910. The statistics are so incomplete that it is difficult to form a definite estimate of the number of patients cured.

Results of 11,123 Cases—Nephrectomy

	Per cent.
Bladder involvement	54.9
Pulmonary involvement	21.16
Genital involvement	22.9
Surgical mortality (up to 1910)	18.82
Surgical mortality (after 1910)	4.39
Dead (time not given)	20.2
Well (time not given)	58.1

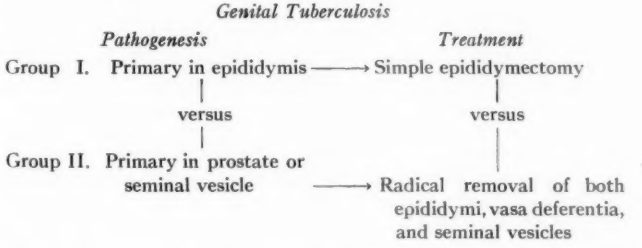
The results following the more advanced bilateral cases have not been so satisfactory. The surgical mortality in this group is very high, many of the cases dying soon after operation from a generalized tuberculosis. When nephrectomy is done prior to an involvement of the bladder, almost 100 per cent. of the cases are cured. After the bladder becomes involved probably less than 60 per cent. are cured. The persistence of bladder symptoms after nephrectomy is sometimes secondary to lesions

in the infected ureter. Often in these cases ureterectomy is indicated. In other cases the involvement of the bladder is so deep seated and the capacity of the bladder is coincidentally so limited that the patient is miserable because of frequency and pain or even the danger from hemorrhage. A still more serious consequence is the spread of the tuberculous lesions about the ureteral orifice and the lower ureter of the uninvolved side. This often causes sufficient obstruction to produce a dilation of the ureter and a gradually progressive hydronephrosis of the remaining kidney. Three such cases have been relieved of this obstruction and attending misery by hydro-ureterorectoneostomy. The first case showed an increase from 5 to 50 per cent. in phenolsulphonephthalein output with complete relief of bladder symptoms. The patient was free from symptoms for four years, when a calculus developed in the kidney pelvis. Entry to the hospital was delayed and the patient was practically in coma when a nephrolithotomy was done. The activity of the kidney never recovered and the patient died of uremia one day later. At autopsy the kidney which had drained for four years into the rectum was free from tuberculosis. The second case lived comfortably for two years, dying in the Emergency Hospital of acute bilateral pneumonia unrelated to the tuberculosis. The third case is living and well two years after operation with good renal function and excellent control of the urine. This patient was able to resume his work after having numerous alarming hemorrhages from the bladder which were not cured until following the operation.

II. GENITAL TUBERCULOSIS

Genital tuberculosis presents one marked similarity to renal tuberculosis in that it frequently occurs as a primary lesion in the genital tract—no associated lesions being found elsewhere. Barney's statistics show that 44.2 per cent. of his carefully studied cases were primary. Our own group of cases showed 39.4 per cent. to be primary, and the balance to be associated with tuberculosis elsewhere. This tendency of the disease to be primary opens up the same argument for treatment as is held proved

for renal tuberculosis. Careful analysis of the statistics, both pathologic and clinical, supports the premise that renal tuberculosis begins in one kidney and that bilateral infection, except in miliary cases, is invariably a late manifestation of the disease. Nephrectomy thus effects a cure by preventing a spread of the disease to other parts of the tract, but the application of this principle in the treatment of genital tuberculosis meets with decided opposition because of the marked difference of opinion as to the probable site of the primary lesion in the genital tract. Two schools have arisen, the one regarding the primary focus to be the epididymis; the second regarding the initial lesion to be in the prostate or seminal vesicles. This dispute has created two distinct problems in the diagnosis and treatment of genital tuberculosis—one with respect to its pathogenesis, and the other to treatment, the latter being largely influenced by one's views regarding the former. This controversy may be summarized by the following diagram:



The arguments of each school might well be considered in outline form:

Evidence of Group I

1. Primary tuberculous epididymitis occurs independently.
2. When genital tuberculosis exists, generally the whole tract is involved, the spread being from the primary lesion in the epididymis.
3. The extent of a lesion can be taken as no criterion of its age, the advanced lesions not necessarily having priority in onset over less advanced lesions.
4. Involvement of the opposite epididymis may be hematogenous.
5. Existing lesions in an epididymis may have been overlooked in those cases reported as supposedly primarily prostatic and vesicle.
6. Improvement or arrest clinically of the lesions recognized clinically

in the vesicle and prostate occurs in the majority of cases following simple epididymectomy.

7. Tuberculosis of the seminal vesicle and prostate is rarely recognized clinically without involvement of the epididymis. Practically all cases seek relief for the epididymitis. (J. Dellinger Barney.)

Evidence of Group II

Clinical.—1. Tuberculous epididymitis alone is rare.

2. Clinical evidence of the presence of tuberculosis in the seminal vesicles or prostate, given by the presence of nodules, without evidence of disease in the epididymis is more frequent.

3. Symptoms of vesiculitis or prostatitis often precede the appearance of tuberculous epididymitis.

4. Whenever the epididymis is involved with tuberculosis the initial lesion is in the globus minor and is analogous to acute infections known to arise by extension from the urethra. When the disease spreads to the opposite epididymis the globus minor is also first involved. From the globus minor it spreads to the body and globus major. In other words every tuberculous epididymitis has 100 per cent. involvement of the globus minor.

Pathologic.—1. Lesions of the epididymis alone are rarely found at autopsy, whereas tuberculous lesions of seminal vesicles and prostate unaccompanied by lesions in the epididymis are frequently reported.

2. When the disease involves the whole genital tract the lesions in the seminal vesicles and prostate generally have the appearance of being more advanced and older.

3. Lesions in the globus minor of the epididymis appear older and more advanced than those of the body or globus major. This portion is the first to soften and break down.

Experimental.—1. Micro-organisms are repeatedly absorbed from the urethra and carried to the epididymis.

2. Tuberculous epididymitis has been produced experimentally by injuring the epididymis and then inoculating the urethra. The organism can travel by way of the lumen of the vas through antiperistalsis or by way of the lymphatics of the vas. (K. M. Walker.)

The above lines of reasoning have existed without much modification for many years. At the International Congress of Urologists held at Brussels (1927), Genital Tuberculosis was the main subject of discussion, and these arguments were again advocated by their various champions—Group I by J. Dellinger Barney, and Group II by Kenneth M. Walker of London. While admitting that the facts presented by those who argue for the primary lesion in the epididmyis are more or less true, the writer inclines to consider the facts indicating the seminal vesicle and prostate as more probably primary to be the more valid. Hugh H.

Young has given this subject careful study for many years and has long been convinced from his clinical and surgical experience that the seminal vesicle or prostate is the primary focus of localization in the great majority of cases, and it is because of this belief that he has advocated radical methods of treatment.

The statistics as to the incidence and extent of tuberculosis of the genital tract are rather unsatisfactory. In the first place genital tuberculosis is not nearly so frequent as renal tuberculosis, the incidence averaging 0.5 per cent. as compared to 1 to 5 per cent. in renal involvement. The high proportion of primary cases reported (Barney 44.2 per cent., our own series 39.4 per cent.) make it seem probable that autopsy studies of these cases would have revealed healed or hidden active lesions elsewhere. The average of various groups of statistics show the secondary cases to vary between 40 and 83 per cent. with involvement found most frequently in the lungs and the urinary tract. The statistics from sanatoria are very incomplete as far as urologic records are concerned. These show that pulmonary tuberculosis is cured in from 65 to 70 per cent. of cases, whereas in the small group complicated with genito-urinary lesions the percentage of cures falls to 20 per cent. Briefly the morbidity of properly treated phthisis is 30 per cent., whereas when it is associated with genito-urinary tuberculosis the morbidity is as high as 80 per cent.

The extent of the disease in the genital tract varies markedly, which would be expected in view of the difficulties of diagnosis. Simple epididymitis has been clinically reported in only from 10 to 15 per cent. of cases. Involvement of the seminal vesicles alone shows an incidence of from 15 to 20 per cent. Lesions in both have been found in 65 to 70 per cent. of cases. It is important to note that these same statistics show an associated lesion in the kidney in about 50 per cent. of all cases.

The initial or early symptoms of genital tuberculosis are not nearly so definite as in renal tuberculosis. The commonest finding is epididymitis evidenced by nodules which seem invariably to involve first the globus minor. The globus minor shows involvement in 100 per cent. of cases, the body of the epi-

didymis in 90 per cent., and the globus major in 66 per cent. The cases of primary involvement in the vesicles or prostate may have some urinary symptoms, but the most valuable diagnostic evidence is that obtained on rectal palpation, nodulation being the characteristic change.

Treatment of Genital Tuberculosis.—In genital tuberculosis decision as to the method of treatment must be made on the basis of conditions and findings in each individual case, and no uniform rule of procedure can be advocated, as in renal tuberculosis. The strongest argument of those who believe that the lesion in the genital tract is primary in the epididymis is the fact that after simple epididymectomy clinical evidence of an advanced lesion in the seminal vesicle and prostate will gradually disappear, pointing to retrogression and healing of this deep-seated lesion after simple epididymectomy. There are, however, other cases in which these deep-seated lesions continue to spread. Probably no one advocates radical treatment of all cases of genital tuberculosis, but there are a number who believe that the best results will be obtained only when such radical treatment is applied to properly selected cases.

We have placed our own series of cases into three groups: (1) Cases of tuberculous epididymitis without clinical evidence of vesiculitis or prostatitis; (2) cases in which the seminal vesicles were involved clinically, but were either untreated or treated by simple epididymectomy; and (3) cases of definite involvement of the seminal vesicles or prostate treated by the radical operation.

The results of these groups are given in the following tables:

Group 1. Cases of Tuberculous Epididymitis Without Clinical Evidence of Vesiculitis or Prostatitis

Total cases..... 17

11 Cases treated by simple epididymectomy:

4 Well.

1 Well, but still has evidence of tuberculosis in bladder and scrotum.

3 Dead since leaving hospital:

2 of tuberculosis.

1 of acute pneumonia.

3 Lost from observation.

(3 of the 11 cases have had nephrectomies.)

6 Cases untreated:

3 Dead.
1 Condition good four years after examination, not heard from since.
2 Lost from observation.
(2 of the 6 cases have had nephrectomies.)

Summary: 12 cases followed:
6 alive.
6 dead.
3 treated.
3 untreated.

Group 2. Cases in Which Seminal Vesicles Showed Evidence of Involvement Clinically—Untreated or Treated by Simple Epididymectomy

Total cases..... 17

5 Cases treated by epididymectomy:

4 Bilateral showing evidence of bilateral seminal vesiculitis.
1 Right side only, showing evidence of bilateral seminal vesiculitis.

2 Well.
2 Poor results (one with very good sanatorium treatment).
1 Died six days postoperative of embolism.

12 Cases untreated surgically:

10 Vesicles involved bilaterally.
1 Right vesicle involved.
1 Left vesicle involved.

Epididymis involved:
4 Bilaterally.
1 Right.
3 left.

Epididymis uninvolved:
4 cases.

Of these 12 cases:
6 Had associated urinary tuberculosis.
3 Bilateral renal tuberculosis.
4 Unilateral renal tuberculosis.
4 Vesical tuberculosis.
1 Had had nephrectomy.
1 Had had orchidectomy.

Follow-up of these 12 cases shows:
8 Lost from observation (4 of these were inoperable because of widespread tuberculosis and 2 others had extensive pulmonary tuberculosis).
Of the 4 cases followed:
2 Are dead of tuberculosis.
1 Is in fair health six years after examination.
1 Is still in a sanatorium and in poor condition one and a half years after examination.

Summary: 9 Cases followed:
6 Alive.
3 Dead.
(5 of the 9 had simple epididymectomy):
2 Improved.
2 Worse.
1 Dead.

Group 3. Cases of Whole Tract Genital Tuberculosis Treated by Radical Bilateral Epididymectomy, Vasectomy, Seminal Vesiculectomy, and in Some Cases Partial Prostatectomy

Total cases..... 13

2 Lost from observation.
9 Alive.
2 Dead.
1 Died three weeks postoperatively with extensive tuberculosis.
1 Died one year after operation of generalized tuberculosis.

All of the 9 cases alive are in good health varying from eight years to a month after operation. Those cases that had a partial prostatectomy performed all had a small sinus which persisted for some time, but which eventually healed.

It is of course impossible to make any rigid comparison of the three groups of cases. The 13 cases treated radically showed much better results than those treated by simple epididymectomy or untreated, but it must be remembered that 12 of these cases were clinically free from tuberculous involvement elsewhere. From the results of these 12 cases of Group III we believe the radical operation to be advisable where the seminal vesicles are involved clinically and there is no evidence of active tuberculosis elsewhere, as in none of the cases in Group II in which the vesicles were involved, but untreated, has the improvement been as satisfactory as in cases of Group III in which these lesions were radically removed surgically. We are unprepared to advise seminal vesiculectomy in that group of cases with clinical evidence of tuberculous epididymitis alone (Group I). Many of these cases may show evidence of active tuberculous seminal vesiculitis later, and seminal vesiculectomy can then be performed. Our experience leads to the conclusion that all cases of urinary and genital tuberculosis should be kept under observation for many years after the initial diagnosis and treatment.

The clinical recognition of genital tuberculosis is not always

an easy matter. Many subacute or chronic cases of non-tuberculous infection are difficult of differentiation. Nodulation is a prominent characteristic of the lesion, but some non-tuberculous lesions are also nodular. Because of this difficulty we have made it the rule to perform epididymectomy first and to have an immediate pathologic examination made before proceeding to remove the vesicles. All of our 13 cases of radical removal have been confirmed by microscopic study.

CONCLUSIONS

Genital and renal tuberculosis occur associated with tuberculosis elsewhere, and as a primary lesion unassociated with active tuberculosis elsewhere.

Renal tuberculosis at onset is unilateral, and the best method of attack is by nephrectomy. Nephrectomy should have the precedence in unilateral renal involvement associated with active genital lesions.

Vesical tuberculosis may remain the only active lesion following surgery in both renal and genital cases. Where this is so advanced as to render life miserable because of pain, frequency, and incontinence, and where there is no active tuberculosis elsewhere, temporary nephrostomy with permanent ureterorectoneostomy may give relief and prolong life.

There are two clinical types of genital tuberculosis: (1) Where the more advanced or only lesion is in the epididymis; (2) where the seminal vesicles are involved with or without the epididymis. When unassociated with active lesions elsewhere the indication is epididymectomy for Type I and the radical operation for Type II.

With active lesions elsewhere the indications for surgery depends upon the extent of the associated involvement as compared with the genital or urinary involvement.

After treatment of whatever type all cases should be kept under control and observation for an extended period of time, and all of the known clinical methods in the treatment of tuberculosis, such as rest, feeding, tuberculin, sunlight, etc., should be used in conjunction with the surgical procedure.

CLINIC OF DR. W. B. HOLDEN

DEPARTMENT OF SURGERY, UNIVERSITY OF OREGON

URETERAL CALCULUS

THIS patient we are showing this morning is a married woman, thirty-nine years of age. Seven years ago she was operated, via vaginal route, for the removal of a stone in the right ureter. Afterward, it was learned that the stone was not removed, and as the symptoms continued, two weeks later, the right kidney was sacrificed. The proximal end of the ureter was fastened to the skin in the lower end of the kidney incision. This wound has drained at irregular intervals ever since her operation seven years ago. At times this wound closes for a few days, and then breaks open and discharges a small amount of pus, with relief. Her health has been fair until the last two weeks. Since then she has been having shooting pains in the pelvis. She has been confined to her bed part of the time. She has lost some in weight the last two weeks. The rest of the personal history is quite unimportant.

Positive findings in her examination are these: Pulse, 98; blood-pressure, 150/90; a palpable thyroid; and a slight irregularity of the heart. There is a small tender mass at the lower end of the former right kidney incision, which is draining pus. The vaginal examination shows a tender mass in the vault of the vagina on the right side. The *x*-ray shows a circumscribed area of calcification in the region of the lower end of the right ureter. It is impossible to pass a catheter up the right ureter. A catheter passes from the upper end of the ureter in the side, part way down the ureteral tract, but it is impossible to reach the stricture of the ureter at its lower end. We conclude that we are dealing with an impacted stone in the lower end of the right ureter that was left there seven years ago.

The scar tissue from the first operation in the vault of the vagina makes it hazardous to try to remove the stone through the vaginal route. The stone being located so near the bladder orifice, it will be a little difficult to remove this ureter and stone through the extraperitoneal muscle-splitting incision, so we will make a right rectus incision of ample length. We find the ureter very readily and mobilize it from the rim of the pelvis to the bladder. Here we find our stone impacted in the lower end of the ureter. We shall slip that stone back up the ureter a

short distance. Now we have it well above the bladder. We now double clamp the ureter below the stone and cut the ureter between the two clamps. We shall cauterize both ends of this ureter very carefully and ligate both ends with chromic catgut. We shall mobilize the ureter as it runs under the ovarian vessels and behind the cecum. We shall free this ureter well up to its point of attachment to the abdominal wall. We are now closing up the peritoneum from the bladder to the cecum. Before we do this, however, we shall provide for drainage in this location. Retroperitoneal space does not stand infection well, and there may have been some soiling of the wound by our manipulation, although we have been very careful and have cauterized both ends of our severed ureter. To be on the safe side we shall leave a drain in the place where the ureter has been removed. We shall place our drain in this way—place one end of a long cigarette-drain next to the bladder. Tie the upper end of this cigarette-drain to the lower end of the ureter. We now have our drain back of the peritoneum, and suture the entire peritoneal wound from the bladder to the posterior side of the cecum. The upper end of our drain and the entire ureter lies in the pocket behind the cecum, but entirely extraperitoneal. We shall close the abdominal wound without drainage.

Now, we will turn our patient on her left side and mobilize the proximal end of the ureter. This is the fistulous tract that has been discharging pus for the last seven years. This, you see, is very readily accomplished, and as we pull out the ureter, we bring with it the upper end of the cigarette-drain. We shall leave this drain in about ten days. At the distal end of the ureter, whose walls are greatly thickened and ulcerated, is the stone as large as a coffee bean. Later this patient made an uneventful recovery and went home completely relieved.

PLASTIC OPERATION ON PENIS

I HAVE asked this man, Mr. S., to kindly report to us today that we may see the results of a plastic operation which we did on him four years ago. This patient is now fifty-nine years of age. When he first came to see us, January, 1924, he reported that two years previous to that time he had injured his penis riding, and it was sore for about six months. A year before this he had noticed a lump on the dorsum of the penis. Radium had been applied and *x*-ray treatment given. The ulcer, following the radium and *x*-ray, had never healed. He was able to void without difficulty. When we

Fig. 518.—The denuded penis drawn through the scrotum and sutured at the pubis and at the base of the glans penis. The scrotal skin thus covers the penis and both testicles.

first saw him, January, 1924, some nine months after his radium burn, he was thought to have carcinoma developing in the *x*-ray burn of the penis. Outside of this local condition his examination was quite negative.

On the dorsum of the penis, just at the junction of the body, there was an ulcer the size of a half dollar. Anteriorly, the edge of this ulcer was smooth, but posteriorly, it undermined the skin over the pubis. The hair of the pubis was entirely gone, and the entire skin of the penis and pubis showed evidence of *x*-ray burn. There was considerable deformity of the

penis, with marked burning and itching from the burn. We removed the entire skin of the penis and also a portion of the burned skin over the pubis, excising widely around the ulcer at the base of the penis. As this patient had a very pendulous scrotum and plenty of surplus skin, we tunneled the scrotum, drew the denuded penis through this tunnel and fastened the gland of the penis to the scrotum at its most dependent point. This was done January 27, 1924. The accompanying illustration (Fig. 518) is an exact photograph of the condition taken five months later.

The pathologic examination of the removed skin showed the *x*-ray burn and chronic ulceration, but failed to show any malignancy.

June 5, 1924 the skin of the scrotum was loosened underneath the penis, freeing the penis entirely from the scrotum. The entire covering of the penis at that time was scrotal skin. Fortunately, this man had so much redundant scrotal tissue that it was perfectly possible to remove enough skin from the scrotum to cover the entire circumference of the penis, and still have sufficient for covering of the testicles.

I have asked this man to come in today to show us the results of this rather unusual plastic procedure. The wound is healed, the penis is entirely freed from the scrotum, there is a little redundancy of the skin around the base of the penis, but the man is perfectly happy and very well satisfied with the results. A few red markings (results of the old *x*-ray burn five years ago) are still visible, with no hair about the pubis.

We do not present this case as one of a cure for cancer, because it is questionable whether he ever had cancer, but he did have a very serious *x*-ray burn with extensive ulceration. The contraction of this burn was producing considerable deformity of the penis. The itching, burning, and pain from the ulceration and burn had made this patient very miserable. The removal of this damaged skin has relieved all of these conditions, and has also forestalled the development of malignancy in the *x*-ray burn.

APPENDICEAL ABSCESS OVERSHADOWED BY EPILEPSY

We present this case illustrating how the complications of an original disease may be so prominent and overshadowing that the original disease goes unrecognized.

This patient is a married woman, twenty-one years, waitress by occupation, with a negative family history. The following is the record of her present illness and physical findings as taken by the intern:

She has pain and soreness in the right side of the back that radiate down to the inner side of the leg at night. She has gas pains and pressure that cause numbness of the whole left side of her body and has what she calls "fits," in which she loses consciousness and occasionally control of the sphincters. There is palpitation of the heart, headaches, and dimness of vision. This patient was perfectly well until one year ago. At that time she had an attack of severe cramp-like pains in the middle of her abdomen, which shifted over to the lower right quadrant. She was in bed eleven days at this time. When she first got up she noticed a soreness in the back on the right side, but she returned to work and felt fairly well except for the soreness in her back. Six weeks after the beginning of her illness she began to be troubled with gas on her stomach, which always came on about 7 o'clock at night. Later the gas distress was constant. Eleven months ago, while eating supper, she noticed her left leg becoming numb, and gradually the whole left side of her body becoming involved. This culminated in a "fit," in which she lost consciousness and control of her sphincters, remaining unconscious for fifteen minutes. She says they always have to put something in her mouth to keep her from biting her tongue. She has had one of these spells each month since. Five months ago nocturnal frontal and occipital headaches occurred. Since then she has had chills and fever followed by profuse perspiration every night. On exertion she complained of dizziness and spots before her eyes. There was some palpitation of the heart at night. She reports that when she was taken sick one year ago, with pain in the abdomen, the physician who saw her at that time gave her a hypodermic of morphin. We shall mention the chief characteristics of the physical examination:

She looked anemic. Her ears and eyes were negative. Except for a foul breath, decayed and carious teeth, her mouth was negative. There were no special findings in the chest. The pulse-rate was 92, otherwise the heart was negative. The abdomen showed no masses and no tenderness. On the back there was a slight tenderness to palpation over the right side from the crest of the ilium to the twelfth rib. On fist percussion there was pain which radiated down the inner side of the thigh. Reflexes were equal and active. Pelvic examination was negative. Repeated Wassermanns of blood and spinal fluid were negative. *x*-Rays of the chest and of the kidneys were negative. *x*-Rays of the head and ventriculograms were negative. Cell-count from the spinal fluid was negative. This woman's convulsions

every few weeks had directed the attention of the observers to her cortical centers. Her neuralgia had suggested the possibility of luetic meningitis. Because of the pain and tenderness in the right loin the diagnosis of perinephritic abscess had been considered by a urologist.

The patient reported a temperature of between 99° and 101° F. almost constantly for several months. We believe this patient originally suffered from acute appendicitis, which was unrecognized by the physician who saw her first, and gave her a hypodermic of morphin. We propose to go through the loin and drain a retrocecal appendiceal abscess. We predict that we shall find colon-bacillus pus in this abscess for the following reasons:

Originally, she had a typical attack of appendicitis, was in bed eleven days, got up, but suffered more or less constantly for the past year with pain and soreness in her right side. The month after her original attack she had convulsions—jacksonian type of epilepsy. These came every few weeks, and because of them attention was directed to the brain. These convulsions have so overshadowed the original disease (appendicitis) that the patient has been unable to impress the observers with a lump and tender mass in the right loin. This mass, as you see, is obvious, and the rigidity is marked over the right loin.

We shall now make an incision over this tender mass, and we find quite a quantity of foul colon-bacillus pus. We shall put in drains. We have not opened the general peritoneal cavity. This is not a very large abscess, although it has existed here for one whole year.

Can we explain this woman's epilepsy from these findings? Possibly, although we are not certain; her convulsions may be due to a chronic toxemia produced by this abscess. She may have a metastatic abscess of the brain; she may have a tumor of the brain; or this epilepsy that she has may be due to something entirely unrelated to her original disease—appendicitis.

Later, autopsy showed a large gumma involving the motor area of right cerebral hemisphere.

CLINIC OF DR. EMILE HOLMAN

FROM THE SURGICAL CLINIC OF THE STANFORD UNIVERSITY MEDICAL SCHOOL

ARTERIOVENOUS ANEURYSM

AN arteriovenous aneurysm or fistula is characterized by certain physiologic phenomena which make it one of the most fascinating and unique lesions in medicine. The following cases are presented as illustrative of their physiologic effects upon the circulatory system and of the principles underlying their surgical treatment.

Case I.—An American lumberman, aged thirty-nine years, was admitted to Lane Hospital on September 13, 1926, seeking treatment for varicose veins and a varicose ulcer of the left leg. Bearing directly upon his present complaint was the fact that twenty-four years ago at the age of fifteen he sustained a deep laceration of the left inner thigh from a knife thrust. An excessive hemorrhage occurred which was controlled by a tourniquet and by suturing the wound. Shortly after the injury he noted a thrill on palpation over the left thigh which has been continuously present since that time. In the years intervening since the accident he had been seen by a number of doctors, but none had suggested any correlation between the varicose veins and the laceration of the thigh twenty-four years ago. In the nine months preceding admission he had noted a swelling of the left leg at the end of the day, which subsided during rest in bed.

In recent years definite symptoms of an increasing cardiac insufficiency had appeared. Seven years ago, as a miner, he was compelled to give up working underground because of an increasing shortness of breath, accompanied by a gradual loss in weight and strength. A well-marked dyspnea on walking up-hill developed and his activity was markedly limited as compared to that of his companions. Smoke in the atmosphere (he is a mountaineer) became quite distressing because of his shortness of breath.

In the erect posture he had frequently noted a feeling of faintness and weakness accompanied by blurred vision, which was immediately relieved by lying or sitting down. He never lost consciousness, but he felt that unconsciousness was averted only because he sat down immediately. In the fourteen years preceding admission there had developed a gradual loss of

vision in the right eye until he was unable to distinguish anything except light and darkness with this eye.

The physical examination centered about the left leg and the circulatory system (Fig. 519). The left thigh appeared slightly larger than the right, the circumference at corresponding points being: Left thigh, 52.3 cm.; right thigh, 50.4 cm. On standing the veins of the lower leg on the left were quite

Fig. 519.—Dilatation of heart and artery proximal to the fistula was most pronounced with slight increase in size of left thigh. Note mottled discoloration of lower leg due to varicose veins.

prominent, and the circumference of the calf increased from 36 to 37 cm. There was a small healing ulcer on the inner aspect of the left lower leg, and the lower leg in its distal half showed the marked mottled brownish discoloration so characteristic of prolonged venous engorgement and stasis.

On the inner aspect of the left thigh half-way between the patella and the groin was a small rectangular scar which marked the site of the original

laceration. Two cm. lateral to this scar could be felt a vigorously pulsating femoral artery which on palpation seemed to be twice the size of the right femoral artery. This dilatation extended as far above Poupart's ligament as one could feel—the external iliac being greatly enlarged. The pulsation of the abdominal aorta was unusually and conspicuously prominent to the

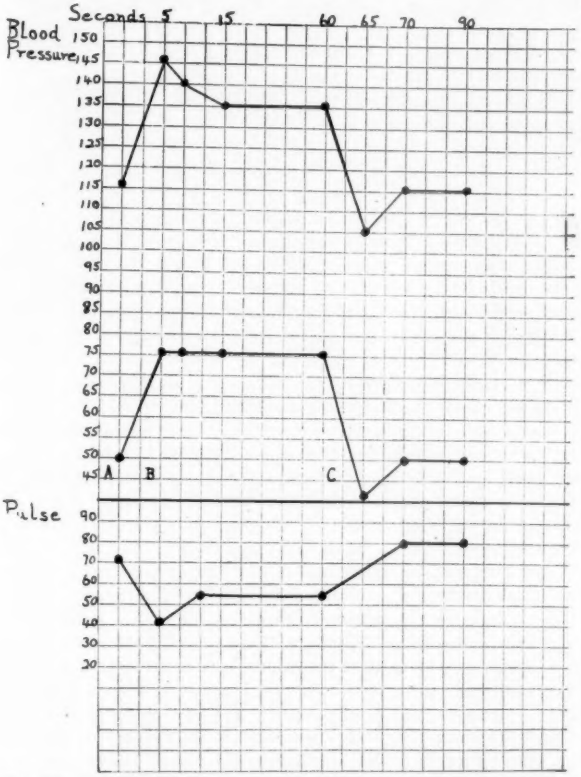


Fig. 520.—Variations in general blood-pressure and pulse on closing and opening the fistula: *A*, Fistula open; *B*, fistula closed by digital compression; *C*, fistula open.

point where it disappeared under the sternum. There was no pulsation in the liver which extended one fingerbreadth below the costal margin.

The dilatation of the femoral artery ceased at a point 3 cm. below the scar. An apparently normal popliteal and posterior tibial were palpated. Palpation of the dilated artery revealed a continuous thrill, maximum 3 cm. below the scar but extending distally for 15 cm. and proximally as far as the

external iliac artery. Over this same segment of artery there could be heard a very loud continuous murmur intensified during systole, greatest at point of maximum thrill, and heard as high as the umbilicus and as low as the popliteal space. Pressure over the site of maximum thrill caused the thrill and bruit to disappear entirely. It was evident from these facts that we were dealing with a large arteriovenous fistula of the femoral vessels.

Blood-pressure Observations.—The blood-pressure in millimeters of mercury as determined by a Pachon sphygmomanometer was as follows: Left arm, 118/60; left leg below the knee, 100/40; right leg below the knee, 160/60; right thigh, 165/60; left thigh below the fistula, 100/50.

The accompanying chart (Fig. 520) indicates the variations in blood-pressure on closing and opening the fistula by digital compression. The systolic blood-pressure in the left arm was 116 mm. Hg. On closing the fistula this rose momentarily for two beats to 146 and then dropped precipitately to 136, where it remained until the fistula was opened, when it dropped to 106, recovering immediately to 116. Parallel changes occurred in the diastolic pressure. It was recorded as 50 with the fistula open. On closing the fistula it rose to 76 where it remained until the fistula was opened when it fell momentarily to 42, but recovered at once to its previous level of 50.

Fluctuations in pulse-rate accompanied these changes in blood-pressure. On closing the fistula the normal rate of 72 dropped immediately to 40 for several beats, remaining at 54 per minute as long as the fistula was closed. On opening the fistula the rate again increased to 80.

The examination of the heart revealed a markedly exaggerated precordial movement, with visible pulsation extending well beyond the nipple line. The apex-beat could be felt in the sixth interspace, 1 cm. outside the nipple line. The relative cardiac dulness extended 5.5 cm. to the right of the midline and 16 cm. to the left of the midline. A loud systolic murmur could be heard over the entire precordium. On closing the fistula in the thigh this cardiac murmur was greatly diminished but it did not completely disappear. A fluoroscopic examination revealed an enlarged heart, the contractions of which appeared to be abnormally increased in vigor and amplitude. The ventricular excursions seemed to be increased in depth and frequency. Closure of the fistula caused the heart momentarily to increase in size, coincident with the remarkable fall in pulse-rate and increase in blood-pressure. The momentary increase in the size of the heart was followed by a diminution to a size at least 3 mm. smaller than the size when the fistula was open. With the fistula closed there was also a definitely diminished vigor of contraction. A teleoroentgenogram showed the cardiac measurements to be as follows: Right transverse diameter, 5.7 cm.; left transverse diameter, 10.2 cm.; oblique diameter, 17.8 cm.; aortic diameter 5.9 cm. (Fig. 521).

An examination of the retina by an ophthalmologist yielded the interesting information that ***the vessels of the retina appeared to be fuller and more prominent when the fistula was closed than when the fistula was open.*** A basal metabolic rate of −12 per cent. was recorded, the actual consumption being 34.6 calories per square meter per hour, as compared to a theoretical normal consumption of 39.1 calories per square meter per hour. The Wassermann reaction was negative.

On September 28th the patient was operated upon under ether anesthesia. A tourniquet was not used. The femoral vessels were exposed and isolated proximally and distally to the point of communication. Proximal to the fistula the artery measured 2.1 cm. in diameter, and the vein measured 2.6 cm. in diameter. Distal to the fistula, the artery measured 0.65 cm. and the vein 1.5 cm. Proximally the vein was thickened, arterialized, and very densely adherent to the artery so that the two could not be separated. A tape ligature, 4 mm. broad, was applied to the artery and vein proximal to

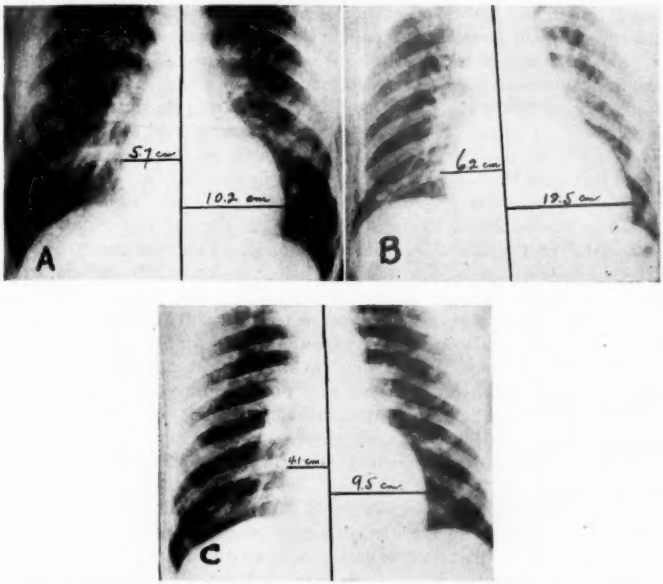


Fig. 521.—Size of heart: *A*, Before operation; *B*, immediately after operation; and *C*, three months after operation. Note the excessive dilatation of the heart immediately after closure of the fistula.

the fistula, the vessels distal to the fistula were ligated separately, and a segment of artery and vein about 6 cm. long containing the fistula was excised. The excised specimen in its contracted form showed an opening between the artery and vein which measured 6 by 7 mm. in diameter. The artery in the contracted specimen measured 1 cm. in diameter as compared to a diameter in the living state of 2.1 cm. It may be inferred, therefore, that the fistula in the living state measured approximately 1.2 by 1.4 cm. The distal end of the divided artery was pulsating at the end of the operation indicating an adequate collateral circulation to the limb beyond the fistula. At no time after operation was there any evidence of an impaired circulation to the foot.

The wound was closed *without drainage*. The pulse at the end of the two-hour operation was 60. The previously dilated heart was even more greatly distended immediately after the operation (Fig. 521). This temporary overdistention disappeared by the third day.

Twenty-four hours after the operation the patient complained of considerable pain, and a dressing revealed a greatly swollen thigh with some blood oozing from the incision. Under gas anesthesia the wound was reopened, and a great deal of blood-clot was removed; a brisk arterial bleeding was found to be coming from the stump of the greatly dilated proximal artery. This was religated and the wound again closed without drainage. Four days later the patient again complained of pain in the thigh and an examination revealed a prominent wound with infiltration and tenderness of the tissues of the thigh. The wound was again opened under gas anesthesia, and pus was found leading down to the stump of the vigorously beating proximal artery which lay bathed in pus. This presented an extraordinarily difficult problem. The forcibly beating artery would certainly burst open in a secondary hemorrhage if it were allowed to continue beating in a sea of pus. Ligation of the common femoral artery, proximal to the profunda femoris, might lead to gangrene of the limb. Our only hope lay in ligating the femoral artery just distal to the branching of the profunda. This was done through a second transverse incision in the groin made under strictly aseptic precautions following a complete change of table, gown, and gloves. The wound of the original operation was then opened widely and thoroughly dakinized for a period of several weeks. A culture was positive for Staphylococcus albus.

Slow but uncomplicated healing occurred and the patient left the hospital two months later subjectively very much improved. Certain pains in the left chest which he had always attributed to an old fracture of a rib had entirely disappeared, his heart felt very much more quiet than before, and he himself noted a gradual diminution in the size of the pulsating artery in the left groin.

Examination on discharge revealed a marked diminution in precordial activity as compared to the cardiac action before operation. There was a great decrease in cardiac dulness and a teleoroentgenogram gave the following cardiac measurements: Right transverse diameter 4.1 cm., left transverse diameter 9.5 cm., oblique diameter 15.1 cm., aortic diameter 5.6 cm. (Fig. 521). On auscultation the systolic murmur which had been present over the precordium before operation was no longer audible. This murmur may, therefore, be definitely associated with the marked dilatation of the heart. The abnormally prominent pulsation of the abdominal aorta had entirely disappeared. The dorsalis pedis and posterior tibial arteries on the left could be easily felt and the nutrition of the limb was excellent. The fulness of the veins of the left leg had disappeared, and the ulcer on the lower leg had healed.

Comment.—*Blood-pressure and Pulse Observations.*—Before operation the general blood-pressure as recorded in the arm was consistently around 120 systolic and 52 diastolic, with a pulse-

pressure of 68. Seven hours following the excision of the fistula the systolic pressure was 134, diastolic pressure 96, with a pulse-pressure of only 38 (Fig. 522). Eighteen hours after the second

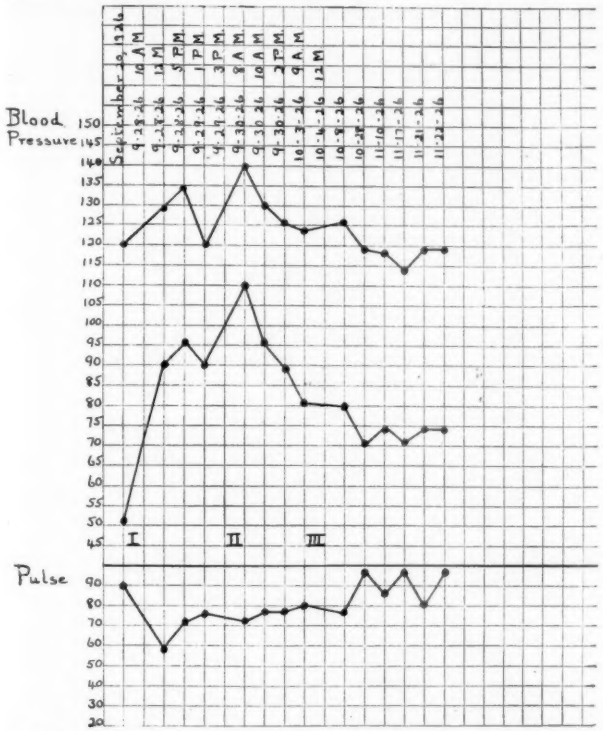


Fig. 522.—Fluctuations in general blood-pressure following excision of fistula. This illustrates the exceedingly high systolic and diastolic pressures which prevail for hours and days following the elimination of the fistula before the total blood-volume is readjusted to the absence of the fistula by reduction in its volume. I, First operation for excision of the fistula. II, Second operation for religation of femoral artery. III, Third operation for ligation of superficial femoral artery just beyond branching of profunda femoris.

operation for religation of the femoral artery the systolic pressure rose to 140 and the diastolic pressure to 110, a pulse-pressure of only 30. A gradual readjustment occurred within the next

few weeks, and when finally stabilized the systolic pressure again lay around 118, the same figure as before operation, but the diastolic level was permanently elevated to about 76, with a pulse-pressure of 42, as compared to a preoperative pulse-press-

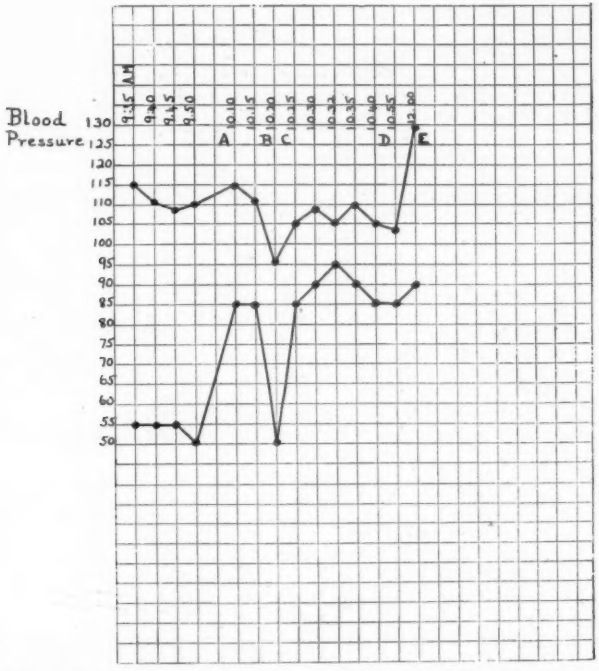


Fig. 523.—Marked fluctuations in blood-pressure during the operation showing particularly the effect of closing the fistula on the diastolic pressure. *A*, Temporary closure of femoral artery and vein proximal to the fistula by tape ligature producing only slight change in systolic pressure, but marked elevation of diastolic pressure. *B*, Release of tape ligature with precipitate fall in both systolic and diastolic pressures. *C*, Closure of artery and vein with tape ligature. *D*, Excision of fistula. *E*, One hour after operation showing retarded effect upon systolic pressure.

ure of 68. This decrease in pulse-pressure was due entirely to the elevation of the diastolic level, which occurred at the operating table immediately after the elimination of the fistula, as the

observations recorded in Fig. 523 show. The permanent elevation in diastolic level is the direct result of eliminating the large area of decreased peripheral resistance introduced by the fistula. The marked temporary elevation in systolic pressure which appeared within a few hours of the operation requires another explanation, which is to be found in the physiologic

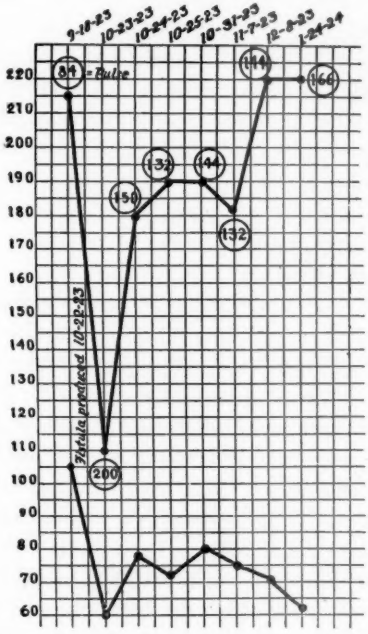


Fig. 524.—Fluctuations in blood-pressure on producing a fistula in the experimental animal are the opposite of those noted when the fistula is eliminated, namely, a permanent lowering of diastolic pressure and a temporary fall in systolic pressure. The recovery of the systolic pressure is due to an increase in total blood-volume.

factors controlling blood-pressure. The establishment of a fistula between the arterial and venous systems results in the short-circuiting of a considerable volume of blood directly back to the heart, the volume depending on the size of the fistula. This short-circuited volume of blood is lost to the rest of the body,

so far as the maintenance of blood-pressure is concerned, and experimentally it has been shown (Fig. 524) that the production of an arteriovenous fistula is followed immediately by a great fall in general blood-pressure. A gradual recovery in systolic pressure occurs, a recovery due to an increase in total blood-volume equivalent to the amount short-circuited through the fistula. The volume short-circuited depends, of course, upon the size of the fistula.

When the fistula is again eliminated from the circulation, the volume of blood formerly flowing through the fistula and the shorter circuit must perforce pass into the general circulation, distending all the vessels of the body with blood. The immediate increase in blood-pressure is due, therefore, not only to the elimination of the area of decreased peripheral resistance, but, also, to the filling up of the normal circulatory system with an excess of circulating fluid.

This filling up of the normal circulatory system is only temporary, and is manifested by a transient dilatation of the heart in excess of the dilatation already produced by the existence of the fistula. In a previous communication[1] it was shown that immediately after the elimination of a large femoral fistula the heart was even more greatly distended than before. This overdistention subsided within twenty-four hours. In the present instance a very similar temporary postoperative dilatation occurred (Fig. 521) which subsided within forty-eight hours to the preoperative size. This observation is of the highest importance. Unexplained deaths have occurred immediately following the operation for the removal of a fistula, and these may well be the result of an excessive cardiac dilatation. Measures to prevent such an overdistention may occasionally be found necessary should circulatory failure seem imminent following the excision of a fistula. One such measure would be the generous removal of blood by venesection, since the overdistention and dilatation are the direct result of diverting an excessive volume of blood into the normal circulatory channels by the elimination of the fistula. Interesting evidence of such a distention of the vessels of the circulatory system was presented in this patient

before operation by the observation that the vessels of the retina and optic disk were obviously larger when the fistula was temporarily closed as compared to their appearance when the fistula was open.

Following operation there is a gradual diminution in the volume of circulating fluid. The general blood-pressure falls (Fig. 522), and the heart gradually shrinks to a normal size (Fig. 521). The first reduction in volume of circulating blood is probably due to a diminution in the plasma volume, with a resulting concentration of the cellular elements of the blood. Evidence of such a regulatory process was obtained in this instance by a study of the cellular elements and of the chemical elements of the blood. The unexpected bleeding into the wound and into the tissues during the first twenty-four hours after operation from the incompletely ligated femoral artery somewhat interfered with these studies, but the following observations are suggestive of a concentration of the blood following elimination of the fistula:

On September 19th when the patient entered the hospital a hemoglobin of 70 per cent. was present with a red-cell count of 5,000,000. On September 28th, eight hours after the elimination of the fistula by operation, the red cell count was 5,990,000 and the hemoglobin 112 per cent. Twenty hours after operation a red-cell count of 5,840,000 was noted with a hemoglobin of 108 per cent., and twenty-four hours later, most probably due to the hemorrhage into the wound, the red-cell count had dropped to 4,400,000 and the hemoglobin to 86 per cent.

Similarly, the total blood-chlorides just preceding the operation were 420 mg. per 100 c.c. of blood. Two days later they totalled 445 mg., and three days later 471.8 mg., following which they again returned to the preoperative reading. The evidence is admittedly meager, but it suggests a temporary concentration of the cellular and chemical elements of the blood through a reduction in blood-plasma.

This patient also presented a startling neurologic phenomenon. Whereas vision in the right eye had been practically absent for fourteen years (the fistula having been present twenty-

four years) within five weeks after the elimination of the fistula vision began to return, and a letter from the patient six months later stated that the vision in the right eye was as good as that in the left eye. It is difficult to state what association, if any, exists between the loss of vision and the lowered diastolic pressure, the latter being the only altered factor which could possibly have affected the eye. The sudden attacks of dizziness and weakness noted in the erect posture were probably dependent upon cerebral anemia. Could diminished arterial supply account also for the dimmed vision?

In a previously described instance[1] a gradually increasing disseminated sclerosis developed simultaneously with the gradually increasing circulatory difficulties due to the presence of a large femoral fistula. It was felt at the time that the two conditions probably existed quite independently of each other, but the presence of a neurologic phenomenon under similar circumstances in a second instance strongly suggests a probable relationship between the two conditions. Both patients presented in the erect posture the curious attacks of weakness and feeling of faintness without loss of consciousness causing the one to fall to his knees and the other to sit down precipitately in fear of losing consciousness.

Case II.—A young lad of eleven years entered Lane Hospital, March 30, 1927, two and one-half months after an injury to the right thigh caused by a small pen knife. At the moment of injury there was a great gush of blood and about ½ pint of blood was lost in a few moments. The child plugged the opening in the skin with his finger until a tourniquet could be applied by his father. This was removed within thirty minutes and no further bleeding occurred. The thigh immediately became greatly swollen and later there appeared an extensive black and blue discoloration. Tenderness and stiffness of the thigh kept him in bed for two weeks. During this time the swelling greatly diminished, with the appearance, however, of a small pulsating tumor in the middle of the thigh, which was described by his doctor as a dilated artery. This tumor gradually became larger instead of smaller and it was because of this fact that his parents sought further medical advice. A limp had been present in the extremity due to the pain in the thigh on walking, but there were no circulatory disturbances.

Examination of the affected leg revealed on the anteromedial surface of the right thigh, 9 cm. below the level of the pubic spine, a rounded swelling 2 by 3 cm. in diameter which showed an expansile pulsation. There was a

small scar just over the proximal half of this swelling. A marked thrill and bruit over the tumor was continuous throughout the cardiac cycle and accentuated in systole. Both thrill and bruit disappeared on pressure over the swelling with an immediate decrease in pulse-rate from 104 to 88, and a transient increase in blood-pressure from 100/60 to 112/70. Pulsation in the posterior tibial and anterior tibial vessels on the right could be felt but its vigor was less than the pulsation in the same vessels on the left. On closing the fistula there was a definite increase in the strength of the pulsation of the vessels on the right below the site of the fistula.

There was a slight weakness of the extensor muscles of the right thigh, but no other impairment of motion. There was a small area of anesthesia to light touch and pin-prick just over and below the patella.

The heart and arch of the aorta were definitely enlarged when observed under the fluoroscope. The right transverse diameter was 2.8 cm., the left transverse diameter was 8 cm., and the oblique diameter measured 12.2 cm. (Fig. 525). Although the fistula had been present only two and one-half months, it was evident from the increasing size of the localized swelling in the thigh that there was no likelihood of a spontaneous closure.

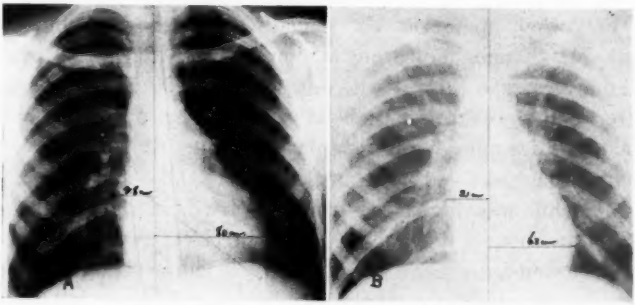


Fig. 525.—Teleoroentgenograms in Case II: *A*, Definite dilatation of the heart in the presence of a fistula of only two and a half months' duration; and *B*, subsidence of this dilatation within two weeks after the elimination of the fistula.

Operation.—The femoral artery and vein were isolated proximal to the fistula and controlled with a tape ligature. The artery proximal to the fistula measured 8 mm. in diameter, the vein 9 mm. There seemed to be no difference in the size of the artery above and below the fistula.

The opening in the artery did not enter the vein directly, but entered a large false sac which was located in the soft tissues below the sartorius muscle. This sac measured about 4.5 cm. in

diameter. From it led a second opening into the femoral vein completing the short circuit from the arterial to the venous systems. The artery and vein were ligated and divided proximal and distal to the fistula, with excision of the fistula. The color in the right foot was excellent following ligation. The wound was closed completely without drainage.

Several interesting observations were made after the operation. Immediately after ligating the artery the systolic blood-pressure rose from 110 to 128, where it remained for about twenty-four hours, when it subsided rapidly to the preoperative level. On discharge, twelve days after operation, the systolic pressure lay between 110 and 120, and the diastolic pressure ranged from 70 to 80 mm. of mercury, a decrease in pulse-pressure of 10 to 20 points. There were no significant changes in pulse-rate.

Following operation the blood-picture showed some remarkable changes indicating a temporary concentration of the cellular elements. A red-cell count of 4,850,000 per cubic centimeter before operation rose on the evening of operation to 5,200,000, dropping within twenty-four hours to 4,900,000. On dismissal he had a red-cell count of 4,700,000.

The child was discharged, cured, twelve days after admission, walking without a limp. Within two weeks after operation the heart showed a definite diminution in size as the following measurements show: Right transverse diameter 3.1 cm.; left transverse diameter 6.3 cm.; oblique diameter 11 cm. (Fig. 525). It is interesting that cardiac dilatation was demonstrable within two and one-half months after the production of the fistula.

Case III.—A retired railway conductor, sixty-three years old, was admitted to Lane Hospital November 9, 1927, complaining of a constant noise in his right ear and head which "was driving him insane."

The past history was unimportant except for the fact that as a young man he had had a genital sore, but numerous blood Wassermann tests had been negative. He had always been a hard worker, and had lived and drunk well.

About twelve years ago he had first noted a slight buzzing in the right ear when lying on his pillow at night. He recalled no injury which preceded this. At this time one of the many doctors whom he consulted noted that he had a low blood-pressure. This was treated by the administration of strychnin.

Several years after its onset the buzzing noise was supplemented by a marked throbbing felt throughout his head, accompanied also by an increasing general weakness, loss of memory, and periodic headaches. There would be periods of variable length when he felt much improved, but the trouble always returned worse than ever. In the three to four months before admission the buzzing and throbbing had given place to an interminable roaring, particularly in the right ear, which was present day and night. During the slightest exertion, such as running or straining at stool, the throbbing and roaring in his head became almost unendurable. There had been attacks also when his heart seemed to stop beating, and the efforts of his many doctors had always been directed to the treatment of his low blood-pressure. There had never been any edema and only moderate dyspnea on exertion.

Examination revealed a florid-faced, well-preserved man, with a rather prominent glassy stare of the eyes. The skull was normal, the extra-ocular movements were unimpaired, and the eye-grounds showed no tortuosity of the vessels. There was no swelling of the neck, but just below the right parotid over an area 3 cm. in diameter could be felt a continuous thrill, which was completely obliterated by deep pressure in the sulcus between the mastoid process and the ascending ramus of the right mandible. On auscultation the characteristic continuous bruit, accentuated in systole could be heard, most marked over the above area, but also audible with the stethoscope over the right cerebellar region, the right temple, and over the left temple as well. Pressure sufficient to obliterate the thrill did not completely eliminate the murmur, a slight systolic bruit being still present. It was evident that closure of the right internal and external carotid arteries would not completely control the arteriovenous leak. The patient was informed of this fact. On palpation the right common carotid artery seemed definitely larger than the left carotid and there was an increased pulsation at the angle of the jaw on the right.

The heart was slightly enlarged to percussion and the roentgenogram showed a normally shaped heart at the upper limit of normal size. The sounds were clear. Blood-pressure readings were 118 systolic, 74 diastolic in the right arm, both when the fistula was open and when the fistula was closed. The pulse of 68 did not vary when the fistula was closed and opened. The electrocardiogram showed a slight left ventricular preponderance. Roentgenograms of the skull and chest were normal.

A diagnosis of an intracranial aneurysm was made, the exact location of which could not be ascertained. The absence of dilated ophthalmic veins seemed to rule out a communication between the cavernous sinus and the carotid artery, although this is the most frequent location of intracranial arteriovenous aneurysms.

Operation.—Under local anesthesia the bifurcation of the carotid was exposed and the external and internal carotid arteries isolated. The internal carotid measured 10 mm. in diameter, the external carotid measured only $6\frac{1}{2}$ mm. Both vessels were ligated, *as was also the accompanying internal jugular vein.*

Following these ligations the patient stated that the bruit was very much decreased, but that it had not entirely disappeared. As this was what had been expected from our preoperative examinations nothing further was attempted and the wound was closed.

The operation was followed by a fairly severe headache which persisted for several days. There were no paresthesias, anesthesias, or weaknesses on the side opposite the ligated carotid, and no mental disturbances. The blood-pressure rose immediately after the operation to 138 systolic, 80 diastolic; fourteen hours later to 140 systolic, 90 diastolic; and twenty-four hours later it was 140 systolic and 84 diastolic. Within thirty-six hours more it had again dropped to 128 systolic and 74 diastolic, around which figure the pressure remained thereafter.

Subjectively following the operation the noises in his head were reduced by about one-half, but a systolic bruit was still present. This was easily controlled by pressure over the left carotid, indicating a connection between this artery and the aneurysm by way of the circle of Willis.

There then followed a period of convalescence during the next four months characterized by alternating periods of disappointment and satisfaction with the results of the operation due to the persistence of the systolic bruit, the frequent headaches, and, for a brief period, double vision due to a paresis of the right external rectus. This latter difficulty gradually disappeared, the bruit also lessened until it could be heard only slightly in the stillness of the night, and the headaches practically disappeared, so that he was finally able to say he had been relieved of about three-fourths of his troubles. Objectively, at this time one could hear only a faint systolic murmur over the site of the original thrill and bruit, and it seemed highly probable that this too would soon disappear.

One of the main points of interest in this man of sixty-three years was the ligation of the internal and external carotid arteries on one side without the development of any cerebral disturbances. This result may perhaps be attributed to the simultaneous ligation of the jugular vein. Whenever ligation of both

carotid arteries is contemplated one should also ligate the accompanying jugular vein.

Discussion.—Although not recognized until recent years, there is no longer any doubt that in most instances the peripheral arteriovenous fistula must be eliminated if the patient is to avoid certain local and systemic effects which threaten not only his comfort but also his life. The local effects are dependent upon the arterial pressure in the venous system, which manifests itself by large varicosities, often complicated by ulcers. A fistula of the subclavian vessels has been accompanied by varicose ulcers of the hand and forearm. The main complaint of the patient may center about these varicosities, particularly when they are on the lower extremities. In one instance the presence of a varicose ulcer prompted the house staff to undertake an operation for the removal of varicose veins, the real lesion, a large femoral arteriovenous fistula, being undiscovered until the patient was under ether. Remarkable edema and swelling of an extremity have been observed, totally incapacitating the individual.

In addition to the local disturbances grave systemic effects may be produced by the cardiac dilatation which follows the large fistula of long duration. Reid[4] has recorded several cases in which death followed cardiac decompensation due directly to a large peripheral fistula.

Granting that a fistula should be eliminated from the circulation, our next problem is when and how this should be done. Reid has shown that some fistulæ tend to heal spontaneously[5] and has advocated waiting six months following the accidental production of a fistula to determine whether or not the opening will close. Holman[2] found, however, that only small fistulæ tended to heal spontaneously, whereas large fistulæ did not. If there is early evidence that the heart is dilating, that the thrill and bruit are increasing rather than diminishing in intensity, and if variations in blood-pressure and pulse on closing the fistula can be produced soon after the establishment of the fistula, and these variations become more rather than less pronounced, one may be certain that the opening will not close spontaneously,

and must be eliminated by operation to avoid further effects upon the circulatory system.

In operating upon this lesion there are certain fundamental principles which must be observed. To neglect them is to invite disaster or failure to cure the lesion.

1. Ligation of the artery alone proximal to the fistula is absolutely contraindicated. The accompanying vein must al-

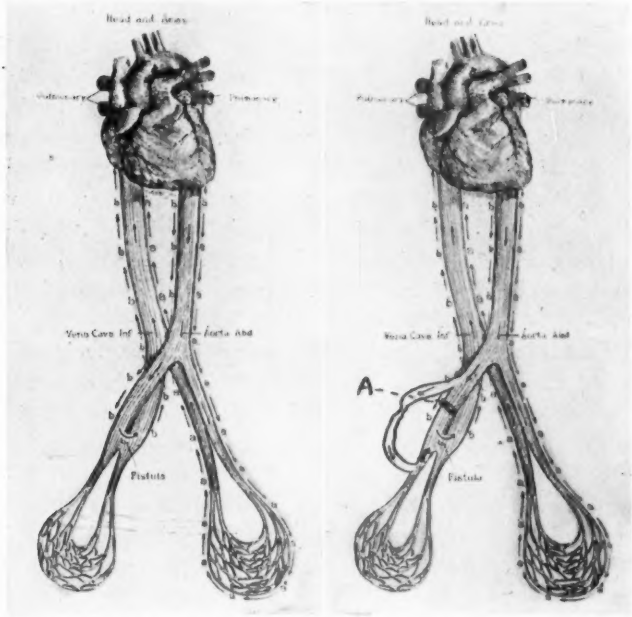


Fig. 526.—Ligation of artery alone at *A*, proximal to a fistula, is absolutely contraindicated, since the collateral circulation will find its way through the fistula without entering the distal capillary bed. Gangrene would be inevitable.

ways be occluded. It is obvious that unless this is done, the collateral circulation (Fig. 526) will find its way not into the capillary bed distal to the fistula, but through the fistula back to the heart.

When confronted with an aneurysm, therefore, it is of the

utmost importance that accurate studies be made to determine whether the lesion is a simple sacculated aneurysm or an arteriovenous fistula. If the latter lesion is overlooked, and the usual treatment for simple aneurysm is applied, namely, proximal ligation of the artery, there is grave danger of gangrene beyond the aneurysm. The distinctive features of a fistula as compared with a true aneurysm are: (*a*) The *continuous* thrill and bruit intensified during systole. (*b*) The slowing of the pulse and rise in blood-pressure on digital closure of the fistula. This sign is not always present in the early days following the establishment of the fistula, and may be absent if the fistula is small. Occasionally it may be detected only by the electrocardiograph. (*c*) The high oxygen content of arterial blood withdrawn from the veins distal to a fistula as compared to venous blood obtained elsewhere. This additional distinguishing feature has been suggested by Pemberton[7] of Rochester.

2. Ligation of the artery and vein proximal to the fistula only is also contraindicated. Even though gangrene may be avoided the fistula is not cured by this operation. Collateral arterial and venous channels open up to keep the lesion active in its capacity of transferring arterial blood into the venous system.

3. Ligation of the artery and restoration of the vein may lead to gangrene due to the great disproportion between a dilated tortuous venous system and the meager collateral arterial circulation. What little blood passes through the collateral bed finds it way promptly into the dilated venous bed without passing into the distal arterial bed.

It is generally agreed that the safest and most effective method of dealing with this lesion is quadruple ligation with excision of the fistula. One can then be certain that no collateral channels will open up to restore the local thrill and bruit, nor will there be any grave danger of gangrene.

Matas[8] has elaborated upon his principle of endo-aneurysmorrhaphy by advocating restoration of the artery through an opening into the vein. This is occasionally feasible, but in some fistulæ of long duration there have been found calcareous de-

posits in the tissue forming the rim of the fistula, and in the presence of such calcification this procedure would be most inadvisable. The subsequent development of a simple aneurysm at the site of the degenerated arterial wall has been observed.

Large fistulæ of long duration are frequently accompanied by evidences of beginning cardiac failure, such as tachycardia and dyspnea on slightest exertion due to an excessive dilatation of the heart. Closure of the fistula by digital compression or by operation may result in an even greater dilatation of the heart as in Case I, with consequently an even greater thinning of an already attenuated cardiac muscle. This additional dilatation may be just sufficient to change an incipient cardiac decompensation to an actual one. This stage may be recognized before operation by noting what occurs when the lesion is closed by digital compression. If instead of a slowing of the pulse and a rise in blood-pressure there occur a marked tachycardia and an unchanged or lowered blood-pressure, it is a good indication that the heart would be temporarily placed under a great strain at the moment the fistula is closed by operation. Cases are on record[9] in which operation has been decided against because of this evidence. Such a decision is denying the patient his only hope of recovery. One should rather proceed on the basis that the cardiac decompensation is purely a mechanical one due to the excessive output imposed by the abnormal opening and that the elimination of this opening by operation offers the only hope for complete relief. Bearing in mind the experimentally proved fact that there is an increase in blood-volume in the presence of the fistula, and that it is this increased volume of blood which is the immediate cause for the temporarily excessive dilatation that occurs after elimination of the fistula, the rational procedure (in the absence of excessive loss of blood due to the operation itself) would be to perform a venesection and to remove at least 500 c.c. and possibly 1000 c.c. of blood during the operation, immediately after the fistula had been eliminated. It seems highly probable that with such a precaution the fistula with well-advanced signs of cardiac dilatation could be operated upon without danger of a cardiac breakdown after the operation.

An additional precaution after an operation for the elimination of a large fistula accompanied by a marked dilatation of the heart is a prolonged convalescence with rest in bed. This is necessary to enable a myocardium long dilated and long accustomed to a low diastolic pressure to adjust itself to the altered conditions of a marked increase in diastolic pressure. Figure 522 gives an excellent illustration of the extent of the increase in diastolic pressure immediately following the operation in Case I. Such an increase might easily impose a considerable strain on the weakened musculature of a greatly dilated heart. Not sufficient attention has been paid to the possibility of a myocardial failure due to the burden of this increased diastolic pressure following the repair of the fistula. A premature return to normal or excessive activity must be avoided by imposing a period of enforced rest under careful supervision for weeks and perhaps for months after the operation. Thompson[10] has recorded an instance in which a return to normal activity within several weeks after the operation resulted in all the signs of a cardiac decompensation. A prolonged rest entirely restored the patient to good health.

Summary.—Careful investigations are necessary when confronted with an aneurysm to determine its exact nature, whether it is a simple sacculated aneurysm, or whether there exists an opening between the artery and vein.

The characteristic features of the arteriovenous aneurysm are: (1) a thrill and bruit continuous throughout the cardiac cycle, but intensified during systole; (2) transient increase in blood-pressure, and fall in pulse-rate on closing the fistula by digital compression; (3) high content of oxygen in the venous blood obtained from the veins near the lesion as compared to the oxygen content of blood removed from veins remotely situated away from the aneurysm.

If the lesion is an arteriovenous communication it is important never to ligate the artery alone proximal to the fistula, as is so frequently done for the cure of a simple aneurysm. Such proximal ligation is contraindicated because of the danger of gangrene of the limb beyond the fistula.

Arteriovenous communications should be eliminated because of the development of cardiac dilatation. Quadruple ligation of artery and vein proximal and distal to the communication with excision of the fistula is the operation of choice.

The elimination of a fistula may precipitate a cardiac decompensation incident to overdistention of an already dilated heart. To avoid this excessive dilatation venesection may be necessary in the course of the operation to withdraw the increased volume of blood which has accumulated in the circulatory system during the existence of the fistula.

A prolonged convalescence after operation is necessary to avoid the myocardial strain which might result from the increase in diastolic pressure accompanying the elimination of the fistula.

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CLINIC OF DR. O. F. LAMSON

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CONGENITAL HYDRONEPHROSIS

THIS patient reported to me a week ago, complaining of a feeling of lassitude and considerable pain in the left side of the abdomen with occasional nausea and vomiting. She is a girl of little more than the average height for her age of thirteen, but does not present a very healthy appearance. She is somewhat anemic and her movements indicated that she is rather lacking in energy.

The function of her heart and lungs seems normal. The examination of the abdomen shows the presence of a very large kidney-shaped tumor extending from beneath the costal margin of the left side down to the left pelvis.

Dr. F. M. Gage of Shelton, who referred this case to me, considered the possibility of a tumor of the spleen, which was quite probable considering its apparent location. However it is my opinion that we have here a tumor of the left kidney. To support my difference in the diagnosis I would like to point out four reasons:

(*a*) The tumor can be palpated between my fingers when I place one hand on the abdomen and the other on the lumbar region.

(*b*) The general contour of the tumor is that of a kidney.

(*c*) Unlike a splenic tumor I can make out fluctuation within the tumor, indicating fluid.

(*d*) The tumor is fixed in its bed, while tumors of the spleen are generally movable.

Further, I was assisted by the statement of the mother and the attending physician at her birth. Both claim that they felt at birth a large tumor in her left side, filling almost the entire abdominal cavity. It has persisted, enlarging as she grew. The patient, besides this tumor in her side, has had no special illness until the last six months, when she experienced occasional nausea and vomiting and has felt generally below par.

The urinalysis is normal, blood-count shows hemoglobin 65 per cent.; red-blood cells 3,500,000. It is quite evident that her symptoms are caused by this tumor and therefore we recommend its removal.

I considered it unwise to subject her to extensive renal and cystoscopic examinations, as she needs all her strength to un-

dergo this operation. We know that she is passing normal urine. The tumor is firmly fixed in its position, and does not have the mobility that we would naturally expect in a splenic tumor. We will make an ample right rectus incision extending from the costal margin to 2 inches below the umbilicus. We open the peritoneal cavity and examine the right kidney. This we find apparently normal, except that it is slightly hypertrophied.

On the left side there is a tumor and we find it to lie entirely extraperitoneal. The spleen above the tumor is pushed inward. The tumor occupies the position of the kidney, although it extends well above and below the kidney area. Fluctuation due to fluid can be noticed on palpation. I think we are justified in saying that we are dealing here with a hydronephrosis of the left kidney. It is quite evident that the kidney-tissues have been completely destroyed in the development of this tumor. There is no line of cleavage to facilitate the dissection of the tumor, as it is densely adherent to the parietal peritoneum on the inner surface, and to the lumbar muscles and fascia on the outer surface. Therefore, it will be necessary to remove the tumor by sharp dissection. I would like to remove the tumor intact, but it will not be possible on account of its size. I am forced to drain the fluid before attempting to remove it. As the descending colon is just in front of it, it requires very careful dissection, as there is considerable bleeding on the surface of the growth where it is dissected from the surrounding tissues.

We are now well down to the base. The ureter is located and I can feel a dilated pelvis at the upper end of the ureter. We will proceed cautiously at this point, as in this mass of adhesions it is rather difficult to locate the renal vessels which must not be torn. It is surprising that I am unable to locate any large bleeding vessels in this area. In the region where the renal vessel should have been there is only a moderate amount of oozing.

We have now succeeded in delivering the tumor, an enormous sac from which the fluid has been evacuated. We find on examination of the gross specimen a very much dilated pelvis of the kidney with complete obstruction at the ureteropelvic

junction. The opening between the pelvis of the kidney and the large hydronephrotic sac is about 2 mm. in diameter. We will send this to the laboratory for examination, and proceed with the closure of the abdomen in the usual manner. On account of the enormous amount of raw surface present in the cavity we will place 2 small cigarette-drains to take care of the secretions during the process of healing.

The pathologist confirms our diagnosis and reports that there is a complete obstruction at the ureteropelvic junction. The size of the gross specimen after being stuffed with cotton measures 25 × 15 × 10 cm., and the pelvis measures 8 × 3 cm.; the cystic wall 2 mm. thick. No renal artery is present. Apparently it received its blood-supply from the stellate arteries of the kidney capsule. The fluid drained from the kidney sac is a thin watery fluid in which many cholesterin crystals are seen suspended. Section of the cyst wall shows but an occasional tubule and a few partially formed glomeruli.

Diagnosis.—A cystic kidney due to imperfect blood-supply and obstruction of the ureter (Fig. 527, p. 1440).

Discussion.—It is quite evident that we have here one of the many congenital abnormalities of the kidney. An interesting factor is that there is no renal artery and vein in this kidney. Possibly there were renal vessels in fetal life, but they must have been completely obliterated due to the obstruction of the ureter and the consequent formation of the hydronephrotic kidney of such enormous size as to cause pressure on the renal vessels; or there may have been a congenital absence of the renal artery, and the kidney received its blood-supply from the stellate arteries of the kidney capsule. It is apparent that an imperfect blood-supply, plus the obstruction of the ureter, contributed toward the development of the enormous hydronephrotic kidney we find in this case. This theory would be supported by the work done by Hinman and Morison in experimental hydronephrosis, published in Surgery, Gynecology, and Obstetrics of 1926. They show clearly the importance of the interference of the blood-supply in the development of hydronephrosis. Their conclusions are based on a series of experiments on animals.

Hydronephrosis resulted in all cases in which the ureter and a branch of the renal artery were ligated.

While it is quite impossible to state definitely that there was a congenital absence of the renal vessels, it is quite evident, however, that there must have been in fetal life a fairly normal kidney. Otherwise, there would not have been sufficient secretion for the development of the enormous tumor felt at birth, and we would find now an atrophied non-functioning kidney which would never have been observed by the mother and the attending physician.

I feel that therapeutically we can feel reasonably assured that this girl will recover from this operation, and probably will have no further trouble as the result of this abnormality. The other kidney is functioning well, and capable of doing the work of both kidneys.

HYDRONEPHROSIS DUE TO AN ANOMALOUS RENAL BLOOD-VESSEL

We have before us a young man twenty-three years of age. When I saw him for the first time a year ago he was complaining of severe pain in the region of the right hypochondrium, extending downward to the lower quadrant. Though he has had intermittent attacks of similar pain at intervals of two or three months, over a period of five years, he attributed the last attack to a rather strenuous hike up the mountains which he had taken just before the onset of the attack.

During the examination we found a slight rise in his temperature, about 100.6° F., otherwise his general condition was good. However, when the field under suspicion was reduced to the right kidney, Dr. O. A. Nelson observed that this kidney was accomplishing only two-thirds of its normal function, and the pyelo-ureterogram sustained the diagnosis of a second degree of obstruction to the urinary drainage.

Nephrolithiasis was excluded because of the less severity of the attacks of pain, the absence of blood in the urine and characteristic stone shadows in the *x*-ray pictures. Further, considering the youth of the patient, it was decided that the renal obstruction was due to an anatomic anomaly at the ureteropelvic juncture, namely to an accessory blood-vessel constricting the upper ureter. As surgery is the only method of relief in such a condition an operation was advised.

Our first step shall be an oblique incision parallel with the quadratus lumborum muscle extending high up into the costovertebral angle, avoiding the ilio-inguinal and the iliohypogastric nerves. We have secured a good exposure of the field. As I am opening the false capsule of the kidney I find considerable adhesions between the capsule and the kidney undoubtedly due to the many previous attacks he has had.

The kidney is now well exposed and our diagnosis is verified. We can plainly see the suspected anomalous blood-vessel crossing the ureteropelvic juncture. It is a renal artery coming from the abdominal aorta and entering the kidney at the lower pole, anterior to the ureter (Fig. 528). At this point the ureter is bent on itself, thus forming a kink. There is no doubt that the etiologic relationship of this blood-vessel is the only visible cause of the renopelvic distention we find here.

Fig. 527.—Lateral photograph taken of hydronephrotic kidney with dilated pelvis at base.

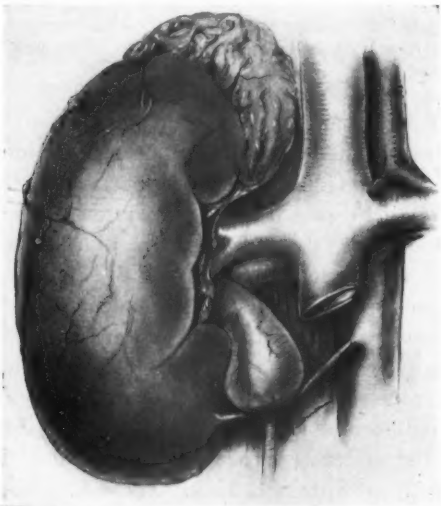

Fig. 528.—Relation of vessel to ureter with dilatation of pelvis of kidney.

The kidney is slightly enlarged and the pelvis of the kidney dilated, somewhat hanging over the accessory vessel as if this were a suspension bridge. However, considering the fact that this kidney is still capable of performing two-thirds of its normal function we will not disturb it, but will confine our operation to the severing of the anomalous vessel. It is my opinion that in due time this kidney will regain its normal functional capacity, as there is no indication of extensive degeneration of renal tissues.

Through ligation and section of the vessel we have removed the main cause of renal obstruction, and by loosening up the adhesions we may well hope to restore the normal anatomic condition in this area. In order to slightly elevate the kidney, and thus reduce the pressure on the ureteropelvic portion, before closing the field of the operation I will take a tuck in the false capsule of the kidney at the lower pole.

Discussion.—Irregularities of the renal blood-supply have been observed for some time. Quain states that 25 per cent. of dissected bodies show an anatomic variation. Branches of the renal artery, or an accessory artery, instead of entering at the hilus, sometimes reach and penetrate the kidney near the upper or the lower end, or on its anterior surface. Sometimes it is difficult to determine whether the anomalous vessel is from the aorta itself or from the renal branch. Generally such vessels, as we see today, run anteriorly to the ureter and enter the lower pole.

Merkel reports a few cases in which the vessels were found posterior to the ureter. Unless such variations are so situated that they cause obstruction to the pelvis or the ureter they naturally do not attract our attention and are only discovered during exploratory operations or at autopsies. All surgeons do not believe that a vessel ventrally placed in relation to the ureter may cause hydronephrosis, but all agree that when dorsally situated may cause such a condition.

We cannot ignore or overlook the fact that mild grades of intermittent hydronephrosis are often found due to a definite kink in the ureter, caused by an anomalous blood-vessel that

extends from the renal vessel or aorta to the lower pole of the kidney. Generally after ligation and section of the offending vessel the patients make satisfactory recovery and show no tendency for recurrence of the condition.

There are some who do not believe that the excision of the vessel will assure satisfactory results, and that a subsequent removal of the kidney will be found necessary. Undoubtedly the prognosis will depend largely on the amount of destruction of the renal tissues. It is my rule to give the kidney a chance to assume its normal function if its functional capacity is not lower than half. Otherwise it may be advisable to remove the affected kidney at the primary operation.

CLINIC OF DR. CHARLES D. LOCKWOOD

PASADENA HOSPITAL, PASADENA, CALIFORNIA

ABSCESS OF THE LUNG

IMPROVED methods of diagnosis, safer methods of anesthesia, and new developments in technic have contributed much to the treatment of pulmonary suppuration. The subject is of increasing importance because of the large number of operations being performed upon the throat and nasal sinuses. Recent studies by Whittemore[1] and others have shown that 50 per cent. of lung abscesses follow such operations. Many of these lung infections fall into the hands of medical men or surgeons weeks or months after their infection; often neither the patient nor the doctor connect the infection with the operation, but assign it to a cold, influenza, or other more recent cause. It is not uncommon for the specialist who performed the operation to be ignorant of the subsequent lung infection and to be skeptical of the etiologic relationship between it and the nose and throat operation. Two such cases have come under my observation in the past year, and are here reported.

Operations upon the nose and throat have been considered too lightly in the past and have been undertaken without sufficient preliminary examination and preoperative care. It is still the common practice among nose and throat specialists to operate upon their cases with only a perfunctory preliminary examination, and usually with no preoperative preparation. Such patients rarely remain in the hospital more than a day or two, and in many instances are not seen by the specialist after leaving the hospital, or, at most, once or twice at his office. In the large majority of cases the results have been satisfactory, but the increasing number of late infections coming into the

[1] Surg., Gynec., and Obst., April, 1924.

hands of the surgeon strongly suggest greater care not alone at the time of operation but also in the preliminary examination and in the postoperative care. This is the most important preventive measure in lung infections. Patients should be observed for four weeks.

Diagnosis: (*a*) History of the case; special attention should be paid to the diseases of childhood, recent attacks of influenza, operations, and aspiration of foreign bodies. (*b*) Physical examination: The usual methods of physical examination should be employed, but they are very often misleading. Auscultation and percussion will many times yield no physical signs. At other times when the abscess cavity is filled they will reveal the signs common to this lesion. *x*-Ray films taken stereoscopically in the anteroposterior position and in the lateral position will often show increased densities and changing fluid levels pathognomonic of lung abscess (see Figs. 529 and 530). The greatest contribution to diagnosis of lung abscess is the injection of lipiodol. *x*-Rays taken after this procedure will definitely outline the suspected abscess (see Figs. 533 and 534).

REPORT OF CASES

Case I.—J. G., a man about twenty-six years of age, Mexican, came to the Olive View Sanitarium with a diagnosis of pulmonary tuberculosis. He had for several months had a cough and expectorated about 120 c.c. of foul smelling pus daily and ran an irregular temperature ranging from 99.6° to 101° F. His general condition was good.

Examination: Positive signs of abscess in the lower lobe of the left lung, no tubercle bacilli could be found. *x*-Ray examination showed a well-defined abscess with a shifting fluid level (Figs. 529, 530).

Treatment: Two-stage operation was done April 10, 1927 resecting the eighth rib, the abscess was located with an exploring needle. The visceral pleura sutured to the parietal with chromic catgut stitches, the wound left widely open and packed with iodoform gauze. April 19, 1927, with a nine-day interval between, the packing was removed, fairly firm adhesions had formed walling off the abscessed area. The abscess was opened by actual cautery and explored with the finger. It was found there were two abscesses, one above the other communicating through an opening 1 cm. in diameter. The drainage-tube was introduced through the lower abscess into the smaller upper one. Patient made an excellent convalescence and was discharged apparently cured, but the abscess cavities gradually refilled and he returned to the Sanitarium. To complete the cure of this case an extrapleural thoracoplasty will be necessary to collapse the rigid wall cavity.

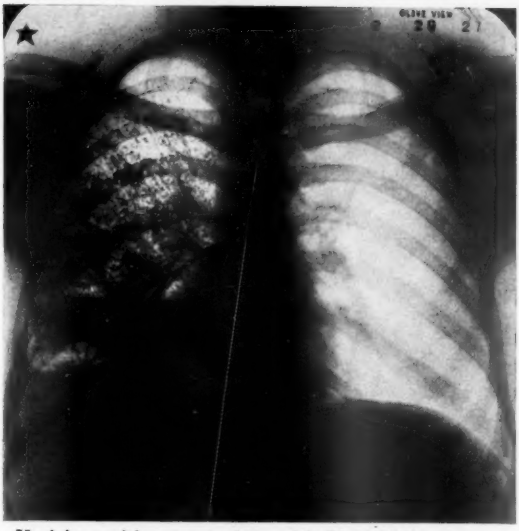

Fig. 529.—Upright position comparison with Fig. 530 demonstrates shifting fluid levels.

Fig. 530.—Recumbent position, comparison with Fig. 529 demonstrates shifting fluid levels.

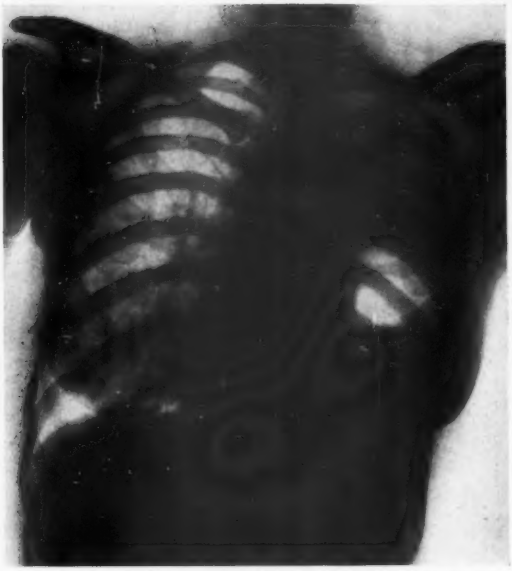

Fig. 531.—*x*-Ray film taken two weeks postoperative, showing upper lobe consolidated with hydropneumothorax.

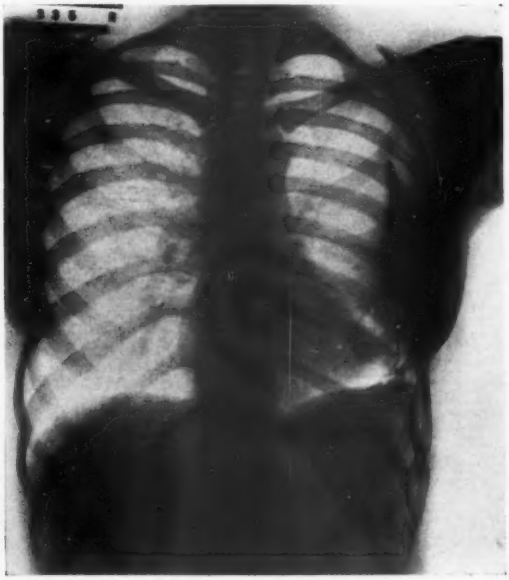

Fig. 532.—*x*-Ray film after lipiodol injection of empyema following upper lobe infection.

Case II.—Mrs. M. McA., female, age thirty-two years. This patient had a tonsillectomy the latter part of September, 1927, under general anesthesia. She left the hospital two days after operation, against the advise of her physician. Two or three days after she returned home, she developed what she thought was influenza; it began with a chill, high fever, severe pain in her left chest. When seen by Dr. J. S. Hibben, in consultation, she was extremely nervous and very ill.

Examination revealed rapid respiration, restricted on the left side, on auscultation few moist râles over left upper lobe, diminished breath-sounds

Fig. 533.—*x*-Ray film after lipiodol. Bronchiectasis, multiple small abscesses.

over the entire lower half of the left chest. Upon percussion there was flatness over an area the size of a hand, just below the scapula, extending forward to the axillary line. *x*-Ray films of the chest showed the fluid low down in the pleural cavity and a consolidation of the upper lobe.

x-Ray diagnosis: Pneumonia or abscess of left upper lobe with pneumothorax and hydrothorax.

Treatment: The chest was first aspirated, and slightly turbid fluid withdrawn, which was sterile on culture. Patient continued to run a high fever and was septic. This was at first thought to be due to lung abscess, but

finally proved to be empyema, secondary to lobar pneumonia following tonsillectomy. This patient finally recovered after extensive thoracotomy and drainage of secondary abscesses beneath the lumbar fascia. Two blood transfusions were necessary to overcome her sepsis and profound anemia (Figs. 531, 532).

Case III.—Mrs. F. L., age thirty-seven years. This patient underwent a prolonged operation in August, 1926 upon her frontal sinus and tonsils under general anesthesia. One week after her operation she began coughing violently, temperature mounted to 103° F., with chills, sweats, and symptoms of lung infection. Her physician Dr. Charles R. Castlen of Seattle,

Fig. 534.—*x*-Ray film after lipiodol, after one year's treatment, still shows dilated bronchi. (Side view.)

Washington, diagnosed an acute lung abscess following aspiration of pus or tonsil tissue. Unsuccessful attempts were made at bronchoscopy, she was given postural drainage, inhalants, and vaccines without benefit. In May, 1927 she came under my observation, still having periodic attacks of high fever and cough with expectoration of several ounces of pus a day. *x*-Ray films of the chest, taken at this time and after lipiodol injection showed multiple small abscesses in the lower lobe, and there were physical signs of lower

lobe infection. Postural drainage was continued and three lipiodol injections were given. There was only slight improvement at first and after six months of expectant treatment multiple thoracoplasties were advised. Patient entered the hospital for this purpose in January, 1928, but meanwhile had developed influenza affecting her left lung. This was considered so serious after consultation that operation was postponed. Postural drainage with rest in bed was continued for three months longer, when patient suddenly made a turn for the better, sputum diminished, cough ceased, and she made an apparent complete recovery. Her improvement I think should be ascribed to the employment of lipiodol, postural drainage, and auto-immunization by her second attack of influenza (Figs. 533, 534).

CLINIC OF DRS. J. TATE MASON AND
HENRY C. TURNER

VIRGINIA MASON HOSPITAL, SEATTLE, WASHINGTON

RUPTURED DUODENAL ULCER TREATED BY JUDD PYLOROPLASTY

T. S., No. 27089, a white married man of forty-two years, was admitted to the Virginia Mason Hospital with the complaint of severe abdominal cramps of six hours' duration.

His family and marital histories were negative.

He had always been extremely well and strong prior to the onset of duodenal ulcer symptoms. Such symptoms consisting of severe epigastric pains, two to three hours after meals (relieved by food or alkalies) had their beginning six years prior to the onset of the present attack. During these six years he averaged one or two periods per year of about two months each, during which time he would have stomach symptoms. The Sippy diet and treatment with alkalies gave entire relief from all symptoms on several occasions. He had never been troubled with nausea, vomiting, hematemesis or melena. All other systems were entirely negative in the past.

The patient's present troubles started two days prior to his admission to the hospital with mild epigastric pains following meals. He was able to get almost complete relief from these pains by the use of alkalies, and continued regularly with his work.

On the morning of April 7, 1928 while at work, the patient was suddenly taken with excruciating upper abdominal pains. The pains soon became generalized throughout the abdomen and were almost unbearable. He felt nauseated but did not vomit. After suffering greatly for about six hours he was brought to the hospital for relief.

On examination the patient was found to be an extremely well developed man, weighing approximately 170 pounds, suffering acute distress. His temperature was 100.8° F. His pulse was 88 and his blood-pressure was 130 systolic and 78 diastolic. His face was pale and he was perspiring rather profusely. His abdomen was extremely tender and presented a board-like rigidity throughout. All other physical findings were entirely negative. The urinalysis was normal.

The diagnosis of ruptured peptic ulcer was made and an emergency laparotomy was advised.

The abdomen was opened within one-half hour after the patient was admitted to the hospital, the patient being in excellent condition at the time.

The upper peritoneal cavity was found filled with gastric and duodenal contents. On the anterior wall of the first part of the duodenum was a perforation about 4 mm. in diameter. This perforation had occurred through the crater of a duodenal ulcer, approximately 1 cm. in diameter and having considerable induration about its border. On the posterior wall of the duodenum just opposite the perforated ulcer was a kissing ulcer of approximately the same size and having approximately the same amount of induration about its border.

The free fluid in the peritoneal cavity was cleaned out as well as possible with the suction apparatus. The portion of the duodenum containing the ulcer was resected and a Judd pyloroplasty was done. The abdomen was closed without drainage.

Fig. 535.—Two ulcers in the resected portion of the duodenal wall.

Following the operation the patient had practically no shock. At no time did his temperature go above 101° F., or his pulse above 100 per minute. There was no vomiting following the operation. The convalescence of a simple unruptured appendix case could not have been more remarkable. The patient was asking for food on the second postoperative day. On the eighth postoperative day, he was able to get up and walk from the hospital with very little inconvenience.

CESAREAN SECTION ON DWARF AGED FORTY YEARS

Mrs. G. W., No. 25847, dwarf, age forty years, entered the Mason Clinic November 15, 1927 with the complaint of an abdominal tumor.

Her family history was unimportant. Her grandparents, parents, brothers, and sisters were all of normal size. There was no history of dwarfism in the family.

She had been married ten years and had had no pregnancies. The husband was also a dwarf and was approximately the same size as the patient. Her menstrual periods had been somewhat irregular prior to June, 1927, but otherwise normal; since June she had had an amenorrhea.

Her past history, other than being dwarfed, was essentially negative. Dwarfism was attributed to scarlet fever at age of three and a half years. The patient's mother stated that the patient was a perfectly normal sized, healthy baby prior to scarlet fever. Following scarlet fever the patient was unable to walk for a long while and growth was very slow. She reached puberty at thirteen years and she sometimes went from four to six months without menstruation. Her periods were always somewhat irregular, otherwise they were normal.

In September, 1927, one month prior to her visit to the Clinic, her abdomen began to enlarge rather rapidly. The enlargement of the abdomen was accompanied by some early morning nausea and vomiting. The systems were negative in every other respect.

Physical examination showed dwarf, 4 feet, 2 inches tall, weighing 83 pounds. Her blood-pressure was 120 systolic and 70 diastolic. Her temperature was normal and her pulse was 98 per minute. All examinations were essentially negative except for the presence of a palpable rounded tumor which had the feel of a pregnant uterus, in the lower abdomen. Pelvic examination revealed some softening of the cervix. The fetal heart could not be heard. The urine was normal, the hemoglobin was 65 per cent., the red blood-cells numbered 3,920,000 and the leukocyte count was 10,600. The blood Wassermann was negative.

Roentgenologic study of the abdomen revealed the presence of a fetal skeleton.

The diagnosis of pregnancy of approximately five months' duration was made and the patient was referred to a competent obstetrician for prenatal care.

The patient was not seen again until her admission to the Virginia Mason Hospital April 2, 1928, preparatory to cesarean section, immediately preceding onset of labor.

At the time of her admission the patient was hardly able to walk on account of the great size of her abdomen. Otherwise the physical findings

were essentially the same as on her first visit to the clinic. However, the hemoglobin had dropped to 45, and the blood-pressure was systolic 80 and diastolic 20.

On April 4, 1928 cesarean section was scheduled, but on placing the patient on the operating table, even before the anesthetic was started, she suddenly became shocked, her pulse became almost imperceptible, and her systolic blood-pressure dropped to 40. The operation was necessarily postponed on account of the condition of the patient.

During the night of April 5th labor pains started, and early in the morning of April 6th the membranes ruptured. At this time she was most un-

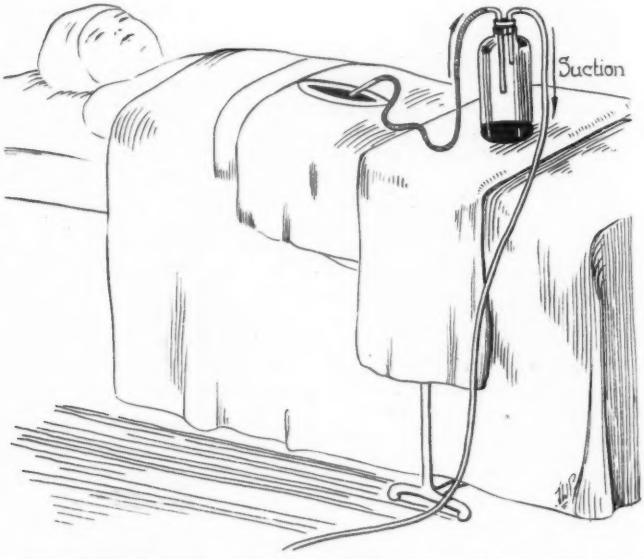

Fig. 536.—Shows method of saving the blood which escaped into the peritoneal cavity and which was later given to the patient as an intravenous injection.

comfortable, but her condition was as good as on admission. Section was immediately scheduled. The abdomen was opened through a high midline incision, the uterus was opened through the transperitoneal route, and a normal viable child weighing 7 pounds and 1 ounce was delivered.

Blood lost into the peritoneal cavity when the uterus was opened was collected by suction apparatus into a sterile jar containing sodium citrate solution (Fig. 536). This was later filtered and given to the patient intravenously. This constituted an autotransfusion of approximately 250 c.c. of blood.

The uterus and abdomen were closed in the usual way and the patient left the table in fair condition. She rallied from the shock of the operation

Fig. 537.—Mother, baby, and nurse sixteen days following cesarean section.

very quickly and her postoperative convalescence was uneventful. She walked out of the hospital on her sixteenth postoperative day. The baby weighed 7 pounds, 10 ounces (Fig. 537).

CLINIC OF DR. A. ALDRIDGE MATTHEWS

ST. LUKE'S HOSPITAL, SPOKANE, WASHINGTON

PERFORATED UTERUS WITH STRANGULATED HERNIA

B. P., age thirty-four years, multipara.

About three hours previous to the time of seeing the patient, an attempted curetment was made. She was aborting at two and a half months. Five days previous to this date she felt rather mean and thought she had influenza. The next day she started to flow without definite cause, which has continued and been quite free for the past two days. Two evenings ago had a chill and temperature. Yesterday the temperature went to 102½° F. The attending physician thought it best to empty the uterus and curet without an anesthetic, as the cervix was fairly well open. The curet was passed in and when brought out a piece of tissue came along with it, which was thought to be placenta. When pulling it out a little further the doctor recognized it to be bowel, and immediately ordered an ambulance to transport her here.

Vaginal examination revealed a loop of bowel, which was quite distended, deep purple in color, filling the vagina. An immediate laparotomy was performed. The uterus was antiflexed, well contracted, and the bowel tightly wedged in the opening in the uterus, which was located on the posterior surface, rather low down, just above the flexure. I opened the uterus from the perforation to the fundus, but found a constriction at the cervix, making it impossible to reduce the bowel; by digital dilation of the cervix from within, was then able to do so, there being about a foot of gut in the strangulated loop. At the time of reducing there was some question in my mind whether the bowel would survive, but wrapped it in warm, wet abdominal packs and proceeded to suture the uterus, which was now empty. Upon inspecting bowel again found it was regaining its color, so deemed it safe to replace. Placed several wick drains as well as a rubber tube in the culdesac and put patient to bed in Fowler's position, gave 1500 c.c. of normal salt solution under her breast. Large hot, wet applications of boric solution were applied to the abdominal wound and these dressings changed every four hours to encourage drainage; also a hot, sterile saline vaginal douche was given once a day. Patient had a stormy time, eventually making a complete recovery.

The day following, February 11th, patient developed an irritating cough, had a gaseous distention of the abdomen, which was soft and not especially sensitive. Took 1800 c.c. of fluid by mouth, urinary output being 350 c.c. for the first twenty-four hours following the operation. February 12th temperature went to 100.6° F., pulse ranging around 120. Vomited 50 c.c. of dark green fluid, stomach much distended with gas. A Rehfuss

tube was placed in the stomach, which was kept in for a number of days. Patient given fluids, the greater portion of which would siphon back. Five hundred c.c. of glucose solution, 10 per cent., was given intravenously, being made up in triple distilled water, and this was given for a number of days.

On the third day following her admission she had a hard chill and there were many during her illness. There was a profuse purulent drainage from the vagina and the abdominal wound, and a considerable amount of sloughing in the latter.

On the fourth day there was a perceptible jaundice, which increased for about a week, patient becoming very yellow, then jaundice gradually subsiding. On the eighth day there was some bleeding on the abdominal wound dressings, but no definite bleeding-point was detected, it being due to suppuration. The amount of blood lost not being great, estimated in all about 2 or 3 ounces.

Two direct transfusions of blood, 400 and 355 c.c., were given, one on the eighth day on account of the jaundice and bleeding, as well as being helpful on account of the sepsis; the second transfusion a few days later.

This patient left the hospital on the thirtieth day to save expense, as conditions were such that she could get good care and nursing at her mother's. Temperature still going up about one degree in the afternoon, wound healthy and granulating, jaundice about gone.

It took another month for the patient to be up and about comfortably.

There are several points that might be emphasized in this case.

It was a mistake to attempt to pass an instrument into the antiflexed uterus without drawing it down, so that the canal could be somewhat straightened.

The doctor is to be commended, for when he found that he had perforated the uterus and a piece of gut had been brought down, to have the condition cared for as quickly as possible.

The after-care in this case was most important. There was much detail in the report which could not be gone into, but some of the more important things were: Release of the strangulated gut, free drainage, Fowler's position to keep the infection in the lower abdomen, supportive treatment, keeping the patient well watered by saline solution and glucose, and very important, especially with her, to keep down her stomach dilation which was done by a retention Rehfuss tube, which was retained for ten

days. Clear liquids were given every three hours, and plenty of water, most of which was siphoned back. It is important to see that the tube is not clogged and continues to siphon. It is satisfying to the patient to be able to drink; even though a lot returns by the tube, it is a simple matter to determine when the patient will tolerate liquids, and that is by clamping the tube from time to time. I have utilized this method for the past two or three years, almost to the exclusion of the ordinary stomach-tube, and washing, postoperative. It is important to see that it is properly placed and retained, as well as to see that it does not become clogged by mucus, etc. A description of this procedure was given by me in SURGICAL CLINICS OF NORTH AMERICA, October, 1927.

IMPACTED STONE IN URETER

Case I.—E. W. H., male; occupation, carpenter. Family and past history of no consequence. About fourteen months ago had a severe pain in his left kidney area. Came on gradually remaining in the same area, no radiation of pain. This lasted for several hours and suddenly disappeared and he felt perfectly well. He noticed no change in his urine. Has had four similar attacks since, and as far as he could tell, there was no change in the location of the pain. The last attack was three days ago. Pain lasted about three hours. Suddenly ceased and felt well as usual.

Physical examination negative. There were 4 to 6 red cells per field in urine, otherwise negative. The *x*-rays are self-explanatory (Figs.

Fig. 538.—Flat film, taken with (*a*) catheter in the beginning of ureter; (*b*) shadow of stone just beyond catheter.

538, 539). The patient remained in the hospital twenty-one days. There was a leakage of urine for a number of days, then intermittent, and by the eighteenth day the wound was healed.

He has been back on two occasions to have a urethral catheter passed, each time about thirty days apart. There apparently was no stricture or tightening of the canal as catheter passed up readily and kidney was functioning normally.

Case II.—E. L., female, age forty-three years. Family and past history of no consequence. About ten years ago had quite a lot of discomfort in left kidney area and saw a physician who told her she had a stone in that kidney, but no examination was made. The discomfort, as she now recalls it, was intermittent, but never severe, and eventually passed away.

For the past three years had attacks of discomfort in her left kidney area. This discomfort was rather severe at times, lasting for a few hours,

Fig. 539.—Same as Fig. 538, after the injection of 25 per cent. sodium iodid, showing stone and dilatation of ureter beyond. Catheter passed full length of opposite ureter.

then she would pass quite a lot of urine and be relieved. This has been happening at irregular intervals, as often as twice a week, and then might go a month or two without further trouble.

Physical examination negative. Urine showed a slight trace of albumin, and a large number of pus-cells. Cystoscopic examination: Urethra and bladder normal, there being a slight reddening and pouting of left ureteral meatus.

x-Ray report: There is an elongated, dense, shadow in lower left pelvis

in contact with ureteral catheter. Injection shows it to lie within the ureter and shows considerable dilation of the ureter above it (Figs. 540, 541).

Patient remained in the hospital thirty-four days. The reason for her being in so long was on account of a repair of the perineum, which was done on the thirteenth day under sacral block anesthesia, following the former operation. The drainage of urine from the wound persisted for fifteen days following removal of stone, the last few days being very little and intermittent. Wound was thoroughly healed by the twenty-first day.

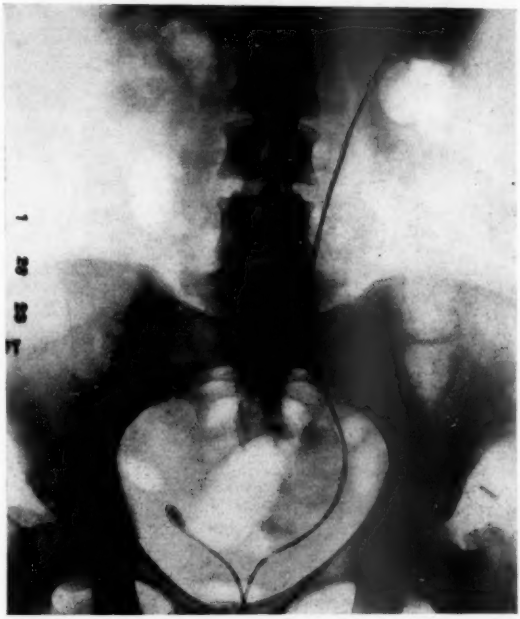

Fig. 540.—Showing catheter passing well up in right ureter. Left ureter obstructed by a dense mass, catheter in contact.

Comment.—Both of these cases were operated upon through an incision starting 1 inch in from the anterior superior spine of the ileum, and extending down to the pubis, being about 1 inch internal to Poupart's ligament. The muscles were separated down to the peritoneum, which was by blunt dissection reflected toward the midline, locating the ureter where it crosses the iliac vessels.

It should be remembered that the ureter is intimately adherent to the peritoneum; that when the peritoneum is stripped up, the ureter is almost always reflected along with it.

The stones in both of these cases being rather large were easily located and were found encysted in the ureter, so the danger of having them slip around was slight.

Fig. 541.—Same as Fig. 540, after injection of sodium iodid. Beyond obstruction, ureter much dilated.

It is well to place a piece of tape around the isolated ureter above the stone and clamp tape tight enough to prevent the stone from slipping up, as often the upper ureter is dilated and, too, the tape will act as a retractor in lifting the ureter up into the field. A longitudinal incision was made and stone readily removed. Interrupted 00 chromic gut was used to suture the opening in the ureter, sutures only taking in the outer coat of

the ureter. These longitudinal wounds will heal without suturing, but I have never resorted to this method. Penrose drain was placed in the wound about ½ inch from the ureter in each case. It has never been my good fortune in these cases to have one not leak some urine for a while.

These cases should be dilated occasionally to be certain a stricture does not develop, more as a result of the incarcerated stone than the healed incision. It is well to make the incision in the ureter above the stone and not directly over it when it has been encysted for some time, thereby the possibility of stricture being lessened.

Various non-surgical methods have been devised for the removal of stones in the lower ureter, and it is estimated that 75 per cent. can be removed or induced to pass. It is further estimated that 70 per cent. of stones which require surgical intervention are located in the lower third of the ureter.

TUBERCULOUS PERITONITIS

C. B., age twenty years, female, student, was referred to me by Dr. Conway of Cheney, mother being in good health, father living but only in fair health, as a young man had tuberculosis and has had a number of pulmonary hemorrhages. There were two aunts who died of tuberculosis. Has always been a healthy girl, weight being 175 pounds and considered herself physically above the average.

About five weeks ago lost her pep and appetite, and noticed her lower abdomen was fuller than normal. Had no pain, inclined to be constipated at times. The fulness gradually increased until the whole abdomen was distended. Does not think she had any temperature.

Physical examination negative except for abdominal distention, which was symmetric. There was a shifting dulness, especially noticeable in the flanks. A succussion wave could be elicited.

Operation: Exploratory laparotomy was done under gas oxygen anesthesia, 4125 c.c. of straw-colored fluid was removed. All the peritoneal surfaces were covered with tubercles. The appendix was removed with difficulty, as it was bound down and very adherent to the surrounding tissue. Was fearful of breaking into the bowel on account of the thickening and friability of the gut wall. The fallopian tubes did not seem to be any more involved than the rest of the viscera. Lymph-glands not involved. Belly closed without drainage. Patient made a good recovery, leaving the hospital on the nineteenth day.

Upon entering hospital she had a normal temperature, leukocyte count 7.475. The temperature following the operation was normal much of the time, but occasionally in the afternoon would go up one or two degrees. After being home for about three days she had a persistent afternoon temperature for four days, the highest being 102° F., then becoming normal and remaining so.

Comment.—Tuberculous peritonitis may occur at any age, but is more common in early adult life.

The focus of infection may be near or remote—intestines, appendix, fallopian tubes, lymph-nodes, lungs, or bones. If the infected focus could be removed, such as the appendix, fallopian tubes, cecum, or mesenteric nodes, thereby preventing reinfection of the peritoneum, it would make the possibility of cure much more favorable.

We may have the exudative, fibrous, and ulcerated forms, and it is possible for all three to exist in the same patient at the

same time, the exudative being the most favorable and the kind the patient reported had. It is difficult and almost impossible to demonstrate the tubercle bacillus in the fluid.

Ascites in young persons, unassociated with heart or kidney disease or edema elsewhere in the body, usually means tuberculosis of the peritoneum. If the patient is in the cancer age it may be difficult to differentiate between malignancy and tuberculosis.

There are a number of theories as to what happens and is responsible for the great benefit many of these cases receive from a laparotomy. There is no question in my mind if the focus of primary infection is removed this would be a long step in the right direction for permanent cure.

In young women it is my rule to do an appendectomy, and not remove the tubes unless they seem definitely the focus of infection, but if the ascites re-forms, repeat the operation and remove the offending focus—tubes or what not—at this time if possible. Drainage in these cases should always be avoided for the fear of a troublesome protracted fistula. The after-care and treatment is just as important as in any other form of tuberculosis located elsewhere.

The theory some time ago was that by opening the abdomen and letting the air and light in proved beneficial, but there is some question how much benefit is derived from this. Relieving the ascites and removing the focus of infection with supportive treatment is inducive to cure. And what possibly does happen is that the exudative form is converted into the dry adhesive form, which is a more favorable stage for spontaneous healing.

RAYNAUD'S DISEASE

L. C., white, male, age thirty-five years, American. Family and past history of no consequence.

Present illness began during the winter of 1925; patient freezing the first two toes on his right foot. At this time the toes were black and painful, especially at night. Four weeks after the freezing, the tips of these toes were amputated and hot boric dressings applied. Then the toe-nails were removed. Sloughing continued and in March, 1925, these first two toes were amputated at the base. Wounds healed and pain subsided; the condition steadily improved and the patient left the hospital the middle of April, 1925. He was discharged from the doctor's care on July 1st as cured.

One year later, August, 1926, patient crushed the tip of his index-finger on the left hand; the skin not being broken. Soon the finger became blackened and began to pain. Lanced one week later, the wound continued to

Fig. 542.—Showing hands all healed at present, also showing trophic changes in remaining nails.

drain and refused to heal. Finally I amputated the tip half way down the nail. The wound continued to slough and pain as before, and in January, 1926 the finger was amputated at the first or distal phalangeal articulation, healing in reasonable time.

In May, 1927 the patient let an iron bar fall on two fingers of both hands, contusing them considerably and breaking the skin on one finger; they became black and pained as before. The ring-finger on the right hand was later amputated at the distal phalangeal articulation. This wound did not heal and continued to slough, so amputation was done at the middle joint. It con-

tinued to slough, but finally healed, months later. The index-finger on the right hand began to slough and finally on February 8, 1928 was amputated at its base. All these wounds healed and the patient suffered no pain subsequently.

In November, 1927 the nail on the third toe, right foot, fell off and sloughing began, with much pain. At this same time the big toe on the left foot became infected following an ingrowing nail. It also sloughed and drained continually, and finally it was necessary to amputate both toes at their base. This was done on February 15, 1928. Since that time, the wounds have continued to slough and drain, with considerable pain asso-

Fig. 543.—Feet of same patient shown in Fig. 542. Wounds of great toe on left foot and base of third toe of right foot unhealed.

ciated, especially at night. Seemingly there was no improvement, in spite of many local applications, etc., large amounts of Ringer's solution internally, and a femoral arterial sympathectomy on both thighs. However, the sympathectomies did give relief for about six days, and the wounds seemed to show some evidence of healing. Figures 542, 543, while poor photographs, show fairly well the condition of hands and feet at this time.

At present the Alpine light is being used, twice daily, with slight improvement. Patient still under treatment.

Comment.—Periarterial sympathectomy consists in the removal of the outer coat of an artery. One to 2 inches of the artery should be stripped in order to eliminate the nerve plexus encircling the artery which is in the adventitia, thus interrupting its connection with the nerves of origin and peripheral plexuses.

A definite diagnosis before operation is most important in these cases, as only a small percentage are cured or improved by

this procedure. I appreciate the fact that some neurologists do not recommend periarterial sympathectomy for Raynaud's disease, but many do.

I am indebted to Dr. George Price and Dr. John Bird for their help in diagnosing this case, as the diagnosis rested between Raynaud's disease, syringomyelia, and Morvan's disease. The absence of sensory dissociation (loss of pain and temperature sense, with preservation of tactile sense) rules out syringomyelia. The preservation of all forms of sensation excludes Morvan's disease, while the symmetric distribution, the color change, and trophic symptoms all point to Raynaud's disease.

It is very important that the circulation of the extremity be thoroughly investigated before the operation is performed.

The most favorable cases for periarterial sympathectomy are the forms of Raynaud's disease with spasm of the vasoconstrictor expressed by local syncope. In these cases it is claimed we get great improvement and sometimes cures according to Rene Leriche:

"When the attacks of syncope are absent, or quite mild, when the disease is characterized by a local asphyxia coming on in attacks, the operation is no longer certain of success. Before its performance the necessary test must be applied with the warm bath, the cold bath, and careful oscillometry. If the cold bath causes the onset of painful spasms, periarterial sympathectomy will probably prove efficient and should be performed. If the cold bath relieves and the warm bath, on the contrary, gives rise to pain, periarterial sympathectomy should not be done, and ramisection should be given preference."

CLINIC OF DR. WAYLAND A. MORRISON

ST. VINCENT'S HOSPITAL, LOS ANGELES, CALIFORNIA

A CASE OF DOUBLE INTUSSUSCEPTION FROM TUMOR OF THE TERMINAL ILEUM

WE first saw this young lady in December, 1925, when she was referred for painful periods and severe attacks of pain in the right lower quadrant. At that time she was studied carefully, and a few days later a strangulated ovarian cyst and chronic appendix were removed. She had an uneventful recovery and was greatly improved until her present attack.

She came under our observation for the second time two days ago. Her present illness dates back two weeks, when she began to have cramp-like pains in the lower abdomen. These pains came on in attacks and usually were relieved by lying down and applying heat. The attacks had no relation to meals, menses, or urination. An enema, however, occasionally would relieve her. More often it increased her discomfort. She was able to work until three days ago, when the pain became very severe and seemed to settle in the right lower quadrant. She was nauseated, but did not vomit. At this time she noticed a mass in her right side. The mass was tender and quite hard. At times it seemed to become softer and the patient thinks it has changed position. She had a similar attack a few weeks ago, which lasted only a few hours.

Physical examination made at this time discloses a well-developed and nourished young woman of thirty-four. Her pulse is 90, respiration 20, temperature 99° F. The skin is moist. There is an anxious look on the face. The head and neck are normal. There are no palpable glands. The chest has no abnormal dulness. Breath-sounds are normal throughout. There

are no râles. The heart is normal in size and position. No murmurs are heard. The abdomen is slightly distended, and there is moderate muscle spasm. In the right lower quadrant is a mass, irregular in shape, apparently in the region of the cecum. Peristalsis is active. Pressure over the mass causes return of the cramp-like pain. There is no shifting dulness. The extremities are normal with all reflexes present and equal. Urine examina-

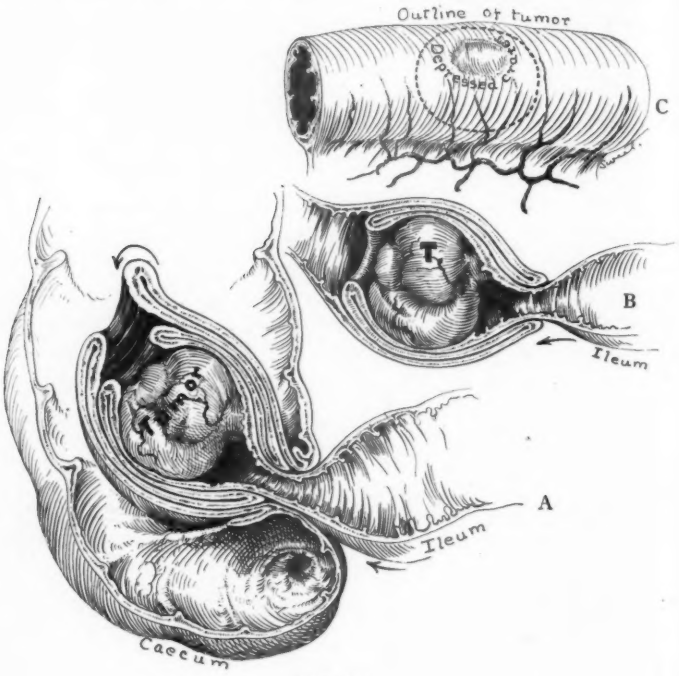

Fig. 544.

tion is negative except for a trace of acetone. The blood-count shows red blood-cells, 4,720,000; hemoglobin, 80 per cent.; white blood-cells, 6837; lymphocytes, 30 per cent.; polymorphonuclears, 68 per cent. The Wassermann is negative.

A barium enema was given and the plate disclosed a finger-like projection into the large bowel through the ileocecal valve.

A diagnosis of intussusception was made from these findings and an immediate laparotomy advised.

A right rectus, muscle-splitting incision is made in the lower abdomen. The peritoneum is opened. The cecum is found to be greatly enlarged. On palpation a large mass can be felt within its walls. Apparently the small bowel is intussuscepted into the cecum through the ileocecal valve (Fig. 544, A).

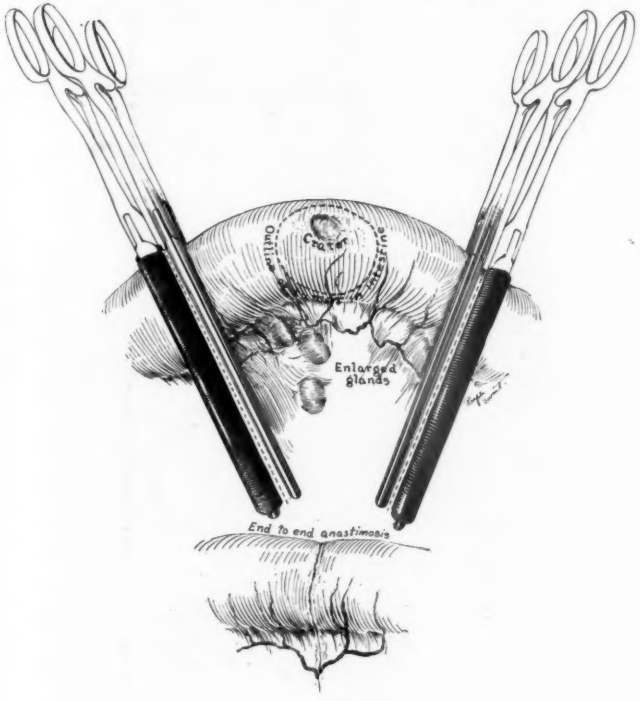

Fig. 545.

By making pressure from above the mass and traction on the small bowel, about 6 inches of the bowel is drawn through the opening. At this point a second mass is felt obstructing the opening. This finally is pushed through the ileocecal valve with some difficulty. Examination discloses a second intussuscep-

tion surrounding a hard tumor mass (Fig. 544, B). This is easily reduced and shows a depression in the small bowel under which is felt a mass the size of a walnut (Fig. 544, C). Several small glands are felt in the mesentery. Clamps are

Fig. 546.—Tumor mass in upper portion.

applied with a wide margin. The mass, mesentery, and glands are removed at the same time. An end-to-end anastomosis is easily accomplished. The wound is closed in layers in the usual manner without drainage.

Examination of the tumor mass shows it to be extremely cellular and very vascular with a fine connective-tissue reticulum. The tumor is composed of large atypical lymphocytic cells, round or oval in form, with oval nuclei and granular chromatin. Many of the nuclei are hyperchromatic, a great many are undergoing mitosis. Many of the mitotic figures are quite irregular.

Fig. 547.—Roentgenogram showing barium enema in this case. Shadow of the intussuscepted small intestine may be seen in the cecum and ascending colon. This shadow was checked by rotating the patient under the fluoroscope, showing the position to be correct.

There is no evidence of an alveolar arrangement of the cells. The tumor evidently is a rapidly growing sarcoma, probably a large celled lymphosarcoma arising from the lymphoid tissue of the bowel. Diagnosis is lymphosarcoma of the intestine.

Tumors of this type are highly malignant, and death usually follows in a few weeks or months. The process may be delayed by the use of *x*-ray therapy, but it is apt to reappear in some

other part of the body. We may expect a recurrence in a few months. In order to give the patient every possible chance *x*-ray therapy will be instituted as soon as she has recovered from the immediate operation.

The position of the tumor is typical. Other less frequent localities are the stomach and rectum. Intussusception is a rather common condition in childhood and causes about 33 per cent. of intestinal obstructions. Over one-half of the cases come within the first year. In later years it is seen less often. In cases where the obstruction of the bowel is not complete, as in this instance, spontaneous sloughing of the mass has been recorded.

Intussusception in the adult is a rather rare condition. This is especially true of multiple intussusceptions. The exciting factor is usually a tumor in the wall of the terminal ileum or an ulceration in the same position. The mechanics of the formation are not definitely understood. However, in this case, it is probable that the primary invagination was the tumor mass through the ileocecal valve, the secondary enteric invagination taking place after the tumor mass was in place in the large bowel.

CLINIC OF DRS. JOHN B. AND WILLIAM B. McNERTHNEY

ST. JOSEPH'S HOSPITAL, TACOMA, WASHINGTON

PARALYSES OF THE RECURRENT LARYNGEAL NERVE

As the next case comes up the corridor, the labored and obstructed breathing of the patient almost makes the diagnosis of bilateral abductor paralysis. This case will burn into one's memory beyond a chance of ever forgetting. It will cause one to always use every care in protecting the recurrent laryngeal nerve, at the same time bearing in mind that factors other than surgical may be responsible for the condition.

As you will see, the patient wears a tracheotomy tube, though for the past twenty-four hours the tube and opening has been blocked. The thyroid gland has been well removed. The luckless surgeon has done his work conscientiously, but through some slip—one of those rebukes we all get to remind us that we are not infallible—the recurrent laryngeal nerves have been left functionless and her vocal cords are closed like the doors of a vault.

The surgeon in the face of such a disaster searches his soul for the cause, not that the real surgeon wishes to shield himself behind the recorded ill-successes of others or meanly throw the blame on Providence. He charges himself with its faults however excusable. No insanity defense or legal makeshift can soften the relentless judgment of the jury that sits within his own mind.

Loss of voice with obstructive breathing may be due to a number of factors and conditions. Sometimes it is the result of arrangement of tissue in the early development of the thyroglossal duct, the product of the median pouch, sometimes anatomic, and lastly, what especially interests us, surgical trauma.

Many of the outstanding contributions to our knowledge of this subject have come to us from the veterinary surgeons, notably the Günthers, father and son, Professors of Surgery in the Hanover veterinary school. Their tireless efforts, experimental and clinical, over a period of sixty years stand as a monumental work in the interest of the dumb beast and should silence forever the antivivisectionists and other foes of research done in the interest of humanity. The work of the Günthers and some well-known Americans—Williams, Blattenburg, and Kalkus of our Pacific Northwest—has shown that man alone does not suffer from conditions that cause paralysis of the recurrent laryngeal nerve.

We owe a debt of gratitude to Dr. J. W. Kalkus, State College, Pullman, Washington. It was he who pioneered the work, "A Study of Goiter and Associated Conditions in Domestic Animals"; and his work on "Orchard Horse Disease" is of extreme interest to the surgeon. You know that in certain counties of the state of Washington, over in the orchard district, bilateral abductor paralysis occurs in enzoötic form in the orchard work horse. Whether it is due to the poisonous effect of arsenate of lead used in spraying or some type of infection has not been entirely cleared up. This knowledge is helpful in convincing ourselves and occasionally a jury that complete bilateral abductor paralysis may take place without any surgical interference whatever.

Each surgeon has some scheme in mind to avoid injury to the recurrent laryngeal nerve; otherwise, like an airman doubtful of his charts, he is lost in the fog. Most of us depend on our knowledge of the normal and pathologic anatomy of the anterior neck. Really, from a practical surgical standpoint, the anatomy of the anterior of the neck comes to the surgeon in four sealed units.

I always like to picture the sternocleidomastoids standing like two pilasters or columns; between the columns the ribbon muscles of the neck form a curtain wall; behind this wall is the visceral space containing the thyroid, the parathyroid, and the recurrent laryngeal nerve (really a dynamo, storage battery, and wiring), and finally two tubes running parallel to the sterno-

cleidomastoid muscles containing the blood-vessels and vagus, transmitting power and current.

Consider the nerve as the electric wiring making direct and indirect connections, under, over, and along these structures.

Now, I am fully conscious of the fact that blending of anatomy and architecture is opposed, of course, to all canons of art, but if advantage is taken of some structural scheme the less mature surgeon can offer to every patient a greater protection to voice and breathing. This is why our suspension technic described in Pacific Coast number, SURGICAL CLINICS OF NORTH AMERICA, October, 1927, is of special advantage.

When he has operated and the patient has become voiceless and has obstructed breathing the surgeon will ask himself, does a true paralysis really exist, that is, is there a true bilateral paralysis with permanent injury with the usual fixed midline position of the cords? This lesion is a real disaster. It requires repair work on the cords or some anastomosis between the recurrent laryngeal nerve and the spinal accessory or descendens noni, or, as Ballance of London, England advocates, an anastomosis of the recurrent nerve to the phrenic nerve. He may ask, "Is this merely a temporary injury?" that is, only due to pressure and edema, or a torsion injury, and the cords the cadaveric position. Here the prognosis is favorable. The vocal cords are the dials. Besides the vocal cords, the respiratory symptoms accompanying complete or partial paralysis of the recurrent laryngeal nerve correspond to the degree of injury on the same side of the chest. It is like puncturing the swim bladders of fish—it incapacitates them for measuring depth. In the human the normal depth of breathing is lost, and the patient develops respiratory complications, aspiration pneumonia—really drowning in their fluids. This is the best proof that the larynx is really a part of the respiratory apparatus. Mayo, Bartlett, Guthrie, Pemberton, and Leahy all have advocated certain principles that furnish the greatest degree of protection to the recurrent laryngeal nerve.

We had fully intended doing an anastomosis of the recurrent laryngeal nerve to the phrenic nerve on this patient this morn-

ing, but you will notice this low-grade type of infection some little distance from her tracheotomy wound. This infection is a contraindication to plastic nerve surgery, therefore we will clean up this infection, see that the tracheotomy opening is working again, and then do our plastic surgery.

There are many different measures advocated for the management of cases of this type, as dilatation of the glottis with bougies, giving only temporary relief. Ballance of London has noted some degree of recovery of function by an anastomosis of the recurrent laryngeal nerve to the phrenic nerve. Frazier recommends end-to-end sutures, selecting always a nerve predominantly motor in function. The right descendens hypoglossi, both from anatomic and physiologic consideration, seems to be ideal. Stealing the nerve-supply of the sternohyoid and sternothyroid muscles is not a serious crime, while taking the spinal accessory cripples the trapezius and sternocleidomastoid muscles. Equally interesting is ventrilocordectomy—removing one cord and the adjacent ventricular floor. This is the scheme that Blattenburg has worked out so ingeniously in the lower animals. He takes an ordinary dental burr with special long handle and places the burr on the outside of the vocal cord. The motion of the burr tucks or puckers up a little mucous membrane. The cicatricial tissue that follows retracts the cords from the midline and creates a breathing space. Of course, this is not practical or advisable, as every human patient is entitled to multiple trials of nerve anastomosis before resorting to partial or complete destruction of the cords.

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MULTIPLE ULCERATED AREAS WITH OBSTRUCTION OF SMALL INTESTINES DUE TO ASCARIS LUMBRICOIDES

GENTLEMEN: This is the case of a Japanese woman; husband and three children living and well. Mother died of typhoid. Two sisters and one brother living and well.

Chief Complaint.—This woman entered the hospital two weeks ago, complaining of fast heart, marked loss of weight—30 pounds in four months. Diarrhea, with frequent stools of mucus stained with blood. She complains of nervousness, tremor of hands, and sweating.

The past history is of little importance except that in the last ten years at various times she has passed a number of Ascarides lumbricoides. The surgical significance of this we will go into a little later. She has had generous courses of vermifuge.

When Dr. Kurata, her family physician, read me this history it aroused my interest that it might be a case of toxic thyroid in a Japanese which, indeed, is very rare. We have quite a large Japanese population in the vicinity of Tacoma. We have seen many Japanese patients in private practice and in consultation with Dr. Kurata and Dr. Yoshimura and others, but in nearly thirty years have never seen a case of toxic goiter in a patient of that race. This is explained by the use of a sea-weed, Japanese tangle, called Kombo, which contains a high iodin content. Almost any time you can see the Japanese coming from the market carrying large strands of this preparation. It is used in soups and other dishes.

Physical Findings.—At first glance you would think this woman in the last stages of pulmonary tuberculosis. The emaciation is marked. Her weight today is only 83 pounds. Pulse-rate is 97. Temperature varies from 99° to 102° F. Respiration is 22. Blood-pressure 100/60. There is no evidence of jaundice. Her tongue is dry. There is no apparent infection of her teeth and tonsils. As you look at her thyroid, it is somewhat enlarged and stands out a little more prominently than the thyroid of the average Japanese patient, but I believe it is due to the loss of weight.

Her basal metabolic rate is −18.

Her chest is negative—no evidence of pulmonary tuberculosis as we first suspected. Her heart is fast, but sounds normal. The blood Wassermann and her urine is negative. The blood-count shows little of outstanding interest except 11 per cent. eosinophils, which stimulates our interest in search of intestinal parasites.

As we go over this patient's abdomen we find it flat. No rose-spots or rigidity, but on deep palpation she complains of pain, especially on the whole right side. As we watch the abdomen during this period of abdominal pain we note an obstructive peristaltic wave such as we see in intestinal obstruction.

As we review the many causes of intestinal obstruction let us not forget the possibility of Ascaris lumbricoides. When I was a student the French writers, Chauffard, Marie, and Fanchon and later Osler, put considerable stress on this remarkable condition. They used to call it typholumbricosis. Let us still bear in mind a first cousin of this condition exists today. I am firmly convinced that for a long time this patient has been suffering from an intestinal inflammation and a partial intestinal obstruction due to the presence of these parasites.

As you ride up the Pacific Coast highway you will notice in Puyallup and other beautiful fertile valleys thousands of Japanese men, women, and children down on their hands and knees, planting, weeding in those truck garden tracts. No union hours govern their time. Early in the morning and long after sunset you can find them at work, and this explains in a measure why this race succeeds so well.

Their habits of cleanliness in their homes are very good. However, in the fields they are exposed to dangers of natural infection through hand and food with ova and embryos.

Now if you review the development of ascarides you can appreciate the surgical significance. You know that in order that an embryo in ova voided by the female in the intestinal tract of the host may develop, sufficient access to oxygen is necessary. Hence the development of the embryos can occur only outside of the animal body.

The valley fields are fertilized during the winter and with the warm rains and sunshine and with a generous supply of free oxygen a rapid segmentation of the ovum occurs and results in the formation of a lively motile embryo. It briefly explains to some degree the enzoötic occurrence of ascaris infection in some of the Japanese people, and, of course, not necessarily confined to the Japanese race.

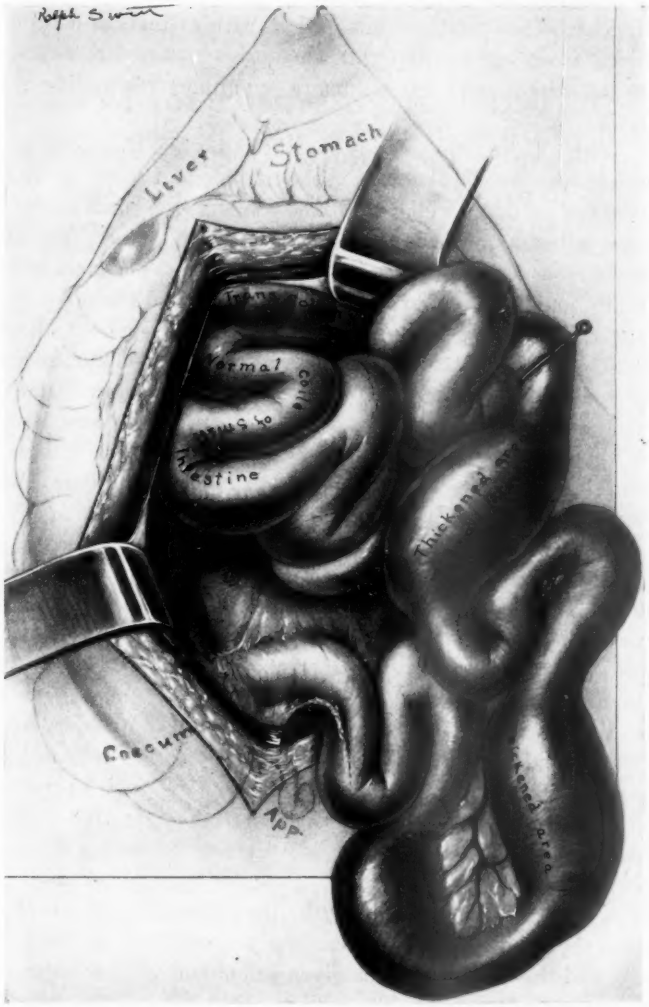

Fig. 548.—Multiple ulcerated areas with obstruction of small intestine due to Acaris lumbricoides, showing the surgical significance of parasitism in the human host.

Surgical Significance.—We have the mechanic irritation, and Mengazzini has produced convulsions with extracts of ascarides; then it is no wonder that this woman is nervous, has a tremor, loss of weight, and has so many symptoms resembling toxic goiter.

With a light nitrous oxide anesthesia by Dr. Egan, our anesthetist, we open the abdomen in the midline and there, as we do, we notice certain peculiar anatomic changes; the small intestines show inflammatory changes along the whole tract. The first ulcerated or indurated area is near the cecum. The large bowel, cecum, and appendix are normal, but see these multiple ulcers in the small gut. They are not tubercular or typhoid, though you can see why this condition was called typholumbricosis. To touch they remind us of the type of pathology found in pyloric stenosis in infants. Nature has protected these bowels by apparently increasing the muscle coats. See, each mass is from 2 to 3 inches long. We do not see any peritoneal scar tissue such as we see in duodenal ulcer.

What we will do temporarily is an operation like we do in acute intestinal obstruction. Select a place above these ulcerated areas and slip in a small tube exactly as we do for acute intestinal obstruction. This operation is for intestinal obstruction symptoms and not a surgical method of removing worms. These worms are securely entrenched, but often following anesthesia they will pass out through this opening or by rectum. I have found them in a case of strangulated hernia, rolled into a mass like so much putty. There, as I open the bowel, I press out a typical parasite of this type. Early diagnosis and medical treatment would have saved this woman from such a disaster, but Dr. Kurata did not see her until too late. After inserting our rubber tube we draw the tube through a mass of omentum to aid the closure of this fistula, close the abdomen in the usual way, and this patient will be given saline and glucose as in the typical case of intestinal obstruction.

ISLANDS OF TOXIC GOITER TISSUE. RECURRENCE OF SYMPTOMS OF EXOPHTHALMIC GOITER EIGHT MONTHS AFTER THYROIDECTOMY

MRS. L., age forty years, entered the hospital complaining of recurrence of symptoms of exophthalmic goiter. Some time ago she traveled 1500 miles elsewhere, and submitted to a thyroid operation. She returned home hopeful that she was permanently cured. You can see at once she has a degree of toxicity and exophthalmos that has warranted a course of Lugol's solution and justifies a second operation.

Fig. 549.—Recurrence of exophthalmic goiter due to islands of hyperplastic thyroid tissue at right upper pole.

Operation.—We remove the somewhat adherent old scar. It is best to dissect and lift up the whole flap, using our suspension technic that holds the flap well up (see SURGICAL CLINICS OF NORTH AMERICA, October, 1927). We avoid going too deeply

into the old scar. By selecting the proper line cleavage we have a splendid flap exposure without one metallic instrument in the wound. There by this extreme high flap dissection you can easily

Fig. 550.—Shows goitrous animal lying down. After somewhat vigorous exercise fell in exhausted condition. (Courtesy of Dr. J. W. Kalkus.)

Fig. 551.—Standing position shows goitrous animal after being exercised by trotting for 100 yards. (Courtesy of Dr. J. W. Kalkus.)

feel and see the contour of this island of toxic goiter tissue at the right superior pole. No other islands of hyperplastic tissue can be felt, and even as I press with the tip of my index-finger

behind the trachea, it seems clear of retrotracheal segments of toxic gland. Now instead of cutting the ribbon muscles transversely we will make a button-hole slit up in the vicinity of the superior pole separating longitudinally the muscles with these small retractions. We approach the area of toxic thyroid tissue just as

Fig. 552.—Japanese school girl returning from market with supply of kombo (Japanese tangle), a type of seaweed carrying a high iodin content and responsible for the absence of goiter in the Japanese race. There is an outstanding frequency of Ascarides lumbricoides among the Japanese in truck garden districts.

scouts approach a fortified island, come in from all directions, and determine the best method of attack.

As you may readily see, nature seems to have regenerated a large mass of gland, and notice this distinct capsule.

We peel off this tissue covering the gland with this peeler, which is merely a curved retractor sharpened to a safe degree. If you go boldly into this securely entrenched island with its generous vascular supply you often get a frightful hemorrhage which masks your operative field, making it difficult to judge the exact amount of thyroid tissue. You see we have splendid exposure and a dry field, and we can plainly see the segments of toxic thyroid gland. We clamp off the right superior thyroid artery, remove the segments of the gland, put in a few stitches to control all bleeding, and I assure you we have removed the

Fig. 553.—Salmon fighting their way to spawning grounds and doing their share in the prophylaxis of goiter because of high iodin content.

woman's trouble for all time. We will let the ribbon muscles drop back into place. Then we will close this button-slit with catgut sutures. We will not drain this case. If in twenty-four hours or later there is a gathering of serum or bulging we will insert a grooved dissector.

Comment.—The upper poles of retrotracheal areas are the segments that seem to lead to so much disaster. It is these areas of gland that occasionally make our medical men accuse the surgeons of not rendering these exophthalmic types of goiter cases complete cures. However, we do know, if these areas are completely removed—the operator leaving only the smallest amount

of thyroid gland—this does give patients the most wonderful results in the entire field of surgery.

It is not of interest to you to review regeneration of the thyroid gland so brilliantly worked out by Marine, Horsley, Halstead, and Else of our own Pacific Northwest.

What interests the practical surgeon is what to do with these remaining islands or areas of regenerated toxic thyroid gland tissue. Where recurrence exists with symptoms you may give Lugol's solution, always hopeful of course of adjusting and maintaining normal thyroid function, but really with the object of preparing a toxic thyroid patient like this one for a second operation.

As in intestinal obstruction with alarming symptoms, following an apparently successful laparotomy, go in and relieve the patient and yourself.

I speak of these areas of thyroid regeneration as islands of toxic tissue. It would seem that the same amount of thyroid tissue left or smeared over a flat surface does not give the degree of trouble as when massed as a mound or fortification; especially is this true when in the neighborhood of a good blood-supply.

It is evident that every cell makes a struggle for life and develops as a definite resistance and occasionally assumes a different or dual function. We see this following the Coffey operation for transplantation of the ureters into the rectum, after a short time the rectum learns to hold the urine instead of absorbing it.

It makes little difference whichever it is, a thyroid cell covered by a mass of scar-tissue or a pine cone covered by moss and rubbish, the very crowded condition furnishes a resistance that apparently seems to accentuate their potential power. Let either one be given the proper elements for growth, and they will ultimately produce thyroxin or a stately pine.

We know it is a fact that the crowded tree that has put up the hardest fight to get light is the one that grows and grows and becomes the giant of our great forest, and interesting it is that many of them are found on the islands that dot the Pacific

coast. Cells, plants, and animal life seem to change habits. Marsh, the naturalist, tells us that the smallest twig of precious coral thrown back into the seas attaches itself to the bottom of the sea or to a rock and grows as well as on its native stem. He also describes a New Zealand bird, originally granivorous and insectivorous, that becomes carnivorous from the want of its natural food supply, and develops new habits of tearing the fleece from the backs of sheep in order to feed upon living flesh.

It has been shown that you can take the Shetland pony and Orkney Island horses that have degenerated in size, and by changing their environments and with an increase of food supply found in our western fields they will grow larger each succeeding generation.

I know this may appear a little foreign to the subject, but my motive is to impress the importance of removing these islands of toxic thyroid tissue especially at the superior pole. When the blood-supply is most generous look out for an island of thyroid cells. That group of cells will grow as in this exophthalmic case and finally give the patient trouble.

CLINIC OF DR. CHARLES E. PHILLIPS

HOLLYWOOD HOSPITAL

DIVERTICULITIS OF THE SIGMOID

Complications: Pelvic Abscess, Septicemia, Intestinal Obstruction, Ileovesical Fistula.

THE patient was referred to me by Dr. A. Elmer Belt, whose able urologic study and assistance contributed greatly to her recovery. It illustrates what may be accomplished by radical surgery in apparently hopeless conditions.

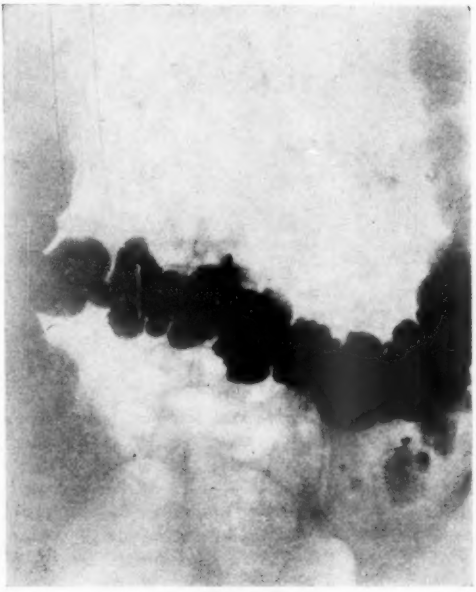

Fig. 554.

The patient, C. R., a lady sixty-five years of age, whose previous and personal histories were essentially negative, entered Barnes Hospital, St. Louis, Mo., on May 21, 1924, suffering from pain and an extremely tender mass in the left lower quadrant of the abdomen. An *x*-ray (Fig. 554) showed the condition to be a diverticulitis of the sigmoid. Her general condition was one of acute suffering and during her stay in the hospital she had displayed daily fever up to 38. In the early part of her stay, she had a positive staphylococcus blood-culture.

Fig. 555.

The bowels had a tendency toward diarrhea, but after about a month they were under control. At about this time dysuria developed and a cystoscopic examination revealed a reddened bladder wall on the sigmoid side. This was interpreted as the result of apposition to pericolonic inflammation. Incidentally, edema of the eyelids and ankles developed, probably due to the administration of alkalies. Relief followed the use of calcium chlorid, 20 grains three times daily. The kidney function remained as it had been, about 30 per cent. Non-protein nitrogen was 26 mg.

The patient was discharged from the Barnes Hospital July 19, 1924

with the following observation: "Her general condition is not so good as on entrance, but her local condition has improved immensely, as the abdomen is now soft and not tender, whereas, in the beginning, there was an extremely tender fulness in the left lower quadrant. Aside from the depressed kidney function, all other examinations were without importance."

Figures 554, 555, taken respectively on May 23 and 24, 1924, show the diverticuli of the sigmoid and also the interference with the free passage of the bowel contents through the sigmoid.

Fig. 556.

The patient came to Los Angeles in July, 1924. Here she was studied by Drs. Dock, Fulton, and Belt. Her condition was becoming more critical. On August 27, 1924 she had a chill and a temperature of 104° F. She was admitted to the Hollywood Hospital September 25th. The patient was very pale, very tired, and quite easily exhausted, even following the mildest manipulation. Swelling of both ankles, especially the right, was noted. The edema readily pitted. Slight edema under the eyes was present. Bimanual examination revealed a huge mass in the pelvis which was nearer

the pelvis outlet on the left than on the right. Examination of the urine showed, unmistakably, the presence of intestinal contents on the first examination. This was again demonstrated on the following day. Her condition was becoming more critical and at a consultation of Drs. Dock, Fulton, and Belt it was decided that active surgical intervention was indicated. *x*-Ray examination (Fig. 556) shows the opaque solution which was injected into the bladder spreading up the wall of the spontaneously anastomosed small intestine.

I saw the patient first on August 29, 1924, and concurred in the decision. On the following day, under gas-oxygen anesthesia, we explored the lower abdomen through a midline suprapubic incision. In the peritoneum, massed with adhesions, was found a loop of ileum firmly adherent and spontaneously anastomosed to the posterior surface of the bladder just to the left of the fundus. This was separated with difficulty. The opening of the ileum was closed. A drain was inserted to the opening in the bladder. No attempt was made to close the bladder opening. The mass in the pelvis was then explored, and a walled-off abscess was found surrounding the sigmoid. This was drained by several large soft-rubber fenestrated tubes. These were brought out through the lower end of the incision. The patient had a very stormy time for the first few hours, but after this a decided improvement took place. The chills stopped. Kidney function improved, and following the insertion of an indwelling catheter by Dr. Belt the bladder infection rapidly improved.

The amount of drainage from the rubber drains inserted into the pelvis was large and foul, gradually changing from a gangrenous to a fecal character. This showed unmistakably that the involved portion of the sigmoid had given way and the entire fecal current was coming through the wound. It was evident that further work was necessary before a cure could be effected. The patient was sent home for a week on September 19, 1924 to relieve the monotony of hospital routine. She was readmitted September 25th, and on the following day, under gas-oxygen anesthesia, a Mikulicz colostomy was performed. This was done to side-track the involved portion of the bowel until it would recover or be restored by operative means.

On the following day the loop was opened with the actual

cautery. Following the diversion of the intestinal contents an accumulation formed in Douglas' pouch.

October 10, 1924 the patient was given another anesthetic and a posterior colpotomy was done with the evacuation of about an ounce of pus. A rubber-tube drain was inserted from the vaginal vault.

Following these operations the patient showed a gradual improvement in strength and general condition. The pelvis

Fig. 557.—*x*-Ray examination March 20, 1925 shows barium injection of sinus connecting with lower part of sigmoid.

abscess cleared up. The sinus leading to the lower portion of the sigmoid persisted and discharged a small amount of mucopus. She left the hospital October 23, 1924.

March 17, 1925 the patient was readmitted to the hospital, and on the following day, under gas-oxygen anesthesia, the sinus leading down to the affected portion of the sigmoid was resected. It was found that a considerable amount of the sigmoid had been destroyed by the inflammatory reaction. By mobilizing

the upper and lower portions of the sigmoid it was found that about 7 inches of the bowel, including the destroyed and badly damaged portions, could be resected and still sufficient length be retained to approximate the ends. As there was not sufficient length left to deliver it from the wound, an anastomosis was performed by means of a large Murphy button. A large sized rectal tube was passed up the rectum and fastened through the

Fig. 558.—Barium enema shows damaged sigmoid, but small passage leading from rectum to sigmoid.

fenestrum of the button. The button was closed, and the anastomosis was reinforced by a few interrupted sutures on the peritoneal side, and further reinforced by omentum.

The button was safeguarded by fastening the rectal-tube to the thigh near the anus. The abdominal wound was closed with drainage.

This was an heroic attempt to restore the continuity of the

lower intestinal segment. Without it the patient was doomed to the inconveniences of a colostomy. Persistent nausea followed and the patient's condition was uncertain for a day or two. Considerable doubt existed in my mind as to the healing because of the tension required to approximate the sigmoid and rectum. Thirteen days later the rectal tube progressed downward about an inch. I was uncertain whether this denoted a closure of the

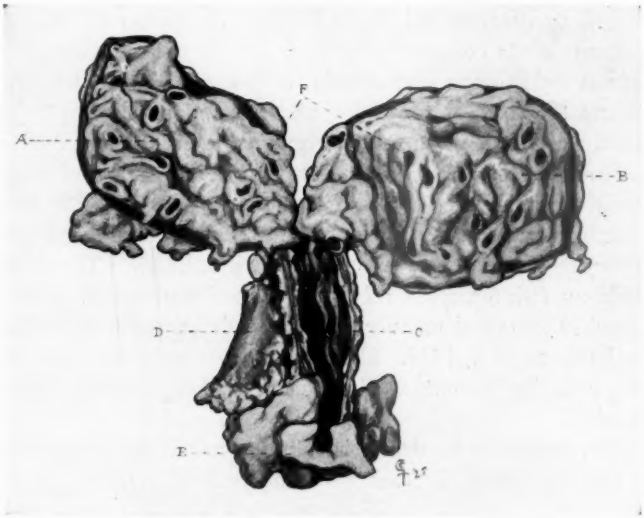

Fig. 559.—A drawing made of the specimen removed and split open: *F* shows the appearance of the diverticuli viewed from the mucosal side; *C* represents the sinus opened longitudinally and connecting the sigmoid (*A* and *B*) with the portion of the rectum (*E*). The appendix (*D*) occupied a position in the wall of the sinus and was removed with the mass. Almost innumerable diverticuli were found, although comparatively few were demonstrated by the *x*-ray.

anastomosis and that the point of junction had settled deeper into the pelvis, or whether the upper segment had become detached. As there were no untoward symptoms I concluded that the line of anastomosis had healed. A few days later a small amount of gas was administered, and the rectal tube with the attached button was removed by slightly dilating the sphincter

ani. The continuity of the lower segment of the bowel was now shown by flushing it with solution. The abdominal wound healed without much difficulty. The patient returned home April 24, 1925.

After a few weeks several attempts were made to break down the spur dividing the proximal and distal segments of the sigmoid. On account of the thickening and contraction of the bowel this was not possible.

She was readmitted to the hospital November 10, 1925, for a closure of the colostomy opening. On the following day, under nitrous oxide-oxygen anesthesia, an elliptic incision was made around the colostomy opening and the abdomen opened. The bowel was freed. The spur portion was excised and an end-to-end anastomosis was performed by suture. The line of anastomosis was reinforced by omentum sewed over it. The reconstructed portion below was examined and found to be satisfactory. The abdomen was closed with drainage. The patient made an uninterrupted recovery. Bowel movements were resumed in a normal manner. She was discharged from the hospital December 8, 1925. She has been perfectly well since that time suffering no untoward effects from her harrowing experience.

The lesson to be drawn is that no case is too desperate to be remedied by good team work and rational surgery.

CLINIC OF DR. E. W. ROCKEY

GOOD SAMARITAN HOSPITAL, PORTLAND, OREGON

REPAIR OF EPISPADIAS AND EXSTROPHY OF THE BLADDER

THAT incontinence of the urine due to absence of the urinary sphincters might be remedied by transplantation of the gracilis muscle was demonstrated by the report of Deming[1] in 1926. Since this time numerous others have reported similar successes. To these I wish to add a case in which there existed a complete epispadias with entire lack of any urinary sphincter, which was successfully treated by the transplantation of the gracilis muscle. Of course here it was necessary to form a urethra before a sphincter could be placed about it.

Case I.—C. M., age four years, seen in July, 1926. Father, mother, and one sister, age fifteen years, living and well. No other children. A normal child in all respects except for the local condition. General health always good. It was noted at birth that the penis was defective, its roof being absent. He has never had control of the urine when up and on his feet.

General examination entirely negative. Local: Both testicles are in the scrotum, which appears normal. There is no roof to the penis. All that can really be seen of the penis is the glans, and the base of this is pulled to the right and back. Urethra lies wide open on the dorsum of this rudimentary penis. The prepuce lies entirely on the ventral side. When the penis is pulled out there is a funnel-shaped opening above the penis which extends into the bladder. We could easily look directly into the bladder and see its posterior wall. There was an entire absence of any urinary sphincter.

First operation (July 22, 1926): Vertical incisions were made along either side of the open posterior wall of the urethra. These were continued up over the pubes, and a flap was turned down from the pubes and lower abdomen and sutured to the posterior

[1] Deming, C. L.: Transplantation of Gracilis Muscle for Incontinence of Urine, Jour. Amer. Med. Assoc., 86–822, March 20, 1926.

wall of the urethra on each side, thus forming a skin-covered anterior wall to the urethra. This flap was made long enough to turn back on itself as far as the base of the glans penis. All stitches were mattress sutures of No. 000 chromic catgut, medium hard. The skin of the shaft of the penis was now drawn around and fastened over the newly formed urethra up to the point of the glans. The external stitches were all of fine black silk. Thus a new urethra was formed by this flap, the inside being lined with skin from the pubes, the outside from the shaft of the penis. An inlying catheter was fastened into the bladder.

There was primary union. He had a good urethra clear to the end of the penis, but had no urinary control whatsoever.

Second operation (October 3, 1927): Transverse incision made across the pubes. Both ends of the incision curved rather sharply downward to facilitate plastic closure for lengthening of anterior wall of shaft of penis. The shaft of the penis was exposed through this incision, and with great care the urethra was dissected free without any opening being made in it. The dissection was simple in front, but was difficult in the back, as the urethra was intimately adherent to the corpora cavernosa. When this had been accomplished the skin incision was extended down the inner aspect of the right thigh to just above the knee. The fascia of the thigh was opened and the gracilis muscle dissected free, great care being taken to preserve the integrity of its nerve and blood-supply. The two nerves, which enter the muscle, were easily identified. The upper nerve and vessels were freed of connective tissue attachments below so that the muscle could be turned upward. The muscle was divided just below the lower nerve supply. The muscle was now turned upward, no attempt being made to preserve the lower nerve. The muscle was passed through below the urethra and brought around the urethra and sutured back to itself, namely, the gracilis muscle with interrupted No. 00 chromic catgut stitches. During this stitching the catheter, which had been placed through the urethra, was removed in order to have the muscle more firmly embrace the urethra. The subcutaneous tissues were now approximated with No. 00 chromic catgut, and the incision which had been made

transversely suprapubically was now approximated vertically, thus lengthening the shaft of the penis anteriorly. The fascia of the thigh closed with the same material. Interrupted silkworm-gut in the skin. Catheter replaced without difficulty to the bladder with the aid of a stilet.

Healing by primary union. Examination in January, 1928. He had developed fair urinary control, but it was a definite effort for him. He could walk about and hold the urine for two hours, but if he ran or played he would leak some of the urine although not all of it. Examination showed that there was contraction of the scar which extended across the right groin. This was slightly thickened, forming a keloid.

Operation (February 1, 1928): Transverse suprapubic incision extending out onto the right thigh, excising 3 inches of the old scar, which was a keloid. The incision extended down to the urethra just at the bladder neck exposing the gracilis muscle which had been transplanted. A catheter was passed into the bladder through the penis, and then No. 0 chromic catgut stitches were placed in such a manner as to tighten the gracilis muscle, which formed this sphincter around the urethra. This was really a puckering of the upper arm of the loop. Subcutaneous tissues closed with No. 00 plain catgut. The contracted scar in the groin was now lengthened in the following manner: A vertical cut was made downward, and a similar one upward, each $\frac{3}{4}$ inch in length. These cuts were made $\frac{3}{4}$ inch apart and the incisions closed in the opposite direction, thus lengthening the incision a distance of $1\frac{1}{2}$ inches. Closure with interrupted silkworm-gut.

Again healing was by primary union. Following this operation he developed good urinary control. He was able to run and play without any leaking, and could go for three hours without voiding. His bladder capacity increased to 6 ounces. When last seen, April 13, 1928, he was able to stop and start the stream on command, and had good control.

Comment.—Before the skin of the pubes was turned in to form this urethra a dermatologist was consulted, who said that the pubic hair which would probably develop in the urethra

later could be eradicated at that time by the application of radium.

This fortunate result suggested the possibility of using the same method in exstrophy of the bladder, the only additional steps necessary being the replacement of the bladder in the abdomen.

Case II.—A. S., age five years. Parents and one brother entirely normal and well. Except for his present defect, patient otherwise entirely well.

Examination shows a normal boy in every way except for the local condition. The abdomen is normal, except that no umbilicus is visible (Fig. 560). The mother states that the umbilical cord came out at the top part

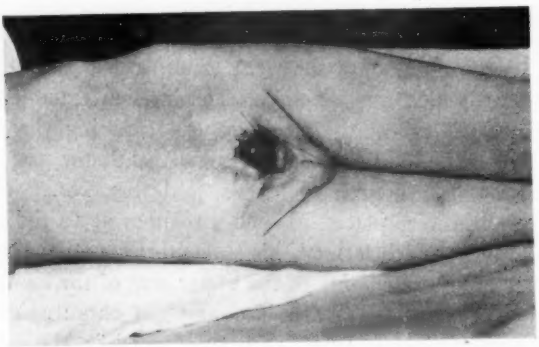

Fig. 560.—Showing absence of umbilicus associated with exstrophy of the bladder.

of the bladder, and that in the contraction of the scar which followed the stump of the cord completely disappeared. There is a complete exstrophy of the bladder with a complete epispadias, the two ureteral orifices standing out on the tops of mounds, the penis lying wide open. On the upper part of the bladder there is a projection which sticks out ½ inch beyond the remainder of the everted bladder. It seems as if the umbilical cord must have come off at this point (Fig. 561). The mother says that it did not, but that it came off directly above this. The testicles lie in the inguinal canals, although they can be pulled down into the scrotum. The whole bladder projects above the level of the abdomen. The divided symphysis of the pubes could be felt well out to either side of the bladder wall, as is shown in the radiograph (Fig. 562). This left a wide defect, triangular in form, with its base downward, where there was no fascia whatsoever. When the child strained this region bulged forward prominently. This child could have had the ureters transplanted into the rectum, but it seemed to me that an attempt should

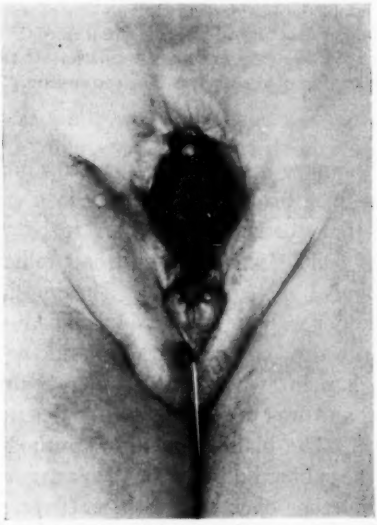

Fig. 561.—Exstrophy of bladder with complete epispadias.

Fig. 562.—Radiograph showing wide separation of pubic bones.

first be made to infold the bladder into the abdomen, second to reconstruct the urethra and a skin covering to the penis, and third, if these two succeed, to build a urinary sphincter from the gracilis muscle. If these fail, one could resort to an implantation of the ureters into the rectum. The above course was recommended.

Operation (January 26, 1928): A horseshoe incision was made just outside the true bladder wall taking in a small amount of skin, but only that portion that seemed to be scar tissue, and which I did not believe would contain hair follicles. This area of scar was about $\frac{1}{8}$ inch in width. The incision was carried down to the bladder wall on the outside. The bladder was then inverted back into the abdominal cavity, and the dissection carried farther to a point where the bladder could be mobilized from the fascia, and was only supported by peritoneum on the sides and above. The bladder was now pushed back into the abdomen with the rubber bulb of a small syringe, and the bladder walls sutured together over this with mattress sutures of No. 00 chromic catgut in such a way that none of the stitches entered that portion of the skin and mucous membrane that was going to be in the bladder cavity. The syringe bulb was now removed and the stitching continued farther downward. A second layer of sutures of the same material were placed over the first, thus giving a very strong suture line. In this way a true bladder cavity was formed. It had been my original plan to discontinue the operation at this point except the closure of the fascial defect, but I saw how easy it was to continue the operation forming a new urethra. Lateral incisions were carried down the edge of the wide open urethra. A No. 12 French catheter was now laid along this urethra into the bladder, and the tissues were folded over it. Two layers of sutures were now placed in exactly the same manner as those described above in the closure of the bladder wall. An attempt was now made to close the defect in the fascia. This was very difficult to accomplish, as there was a 4-inch separation at the symphysis. Finally the anterior sheaths of the rectus muscle were turned inward, the forward side being turned back, the inner edge used as a hinge. These were sutured to each other and to the posterior

sheaths and below to the fibrous tissue that lay across where the bony symphysis should have been. No. 0 chromic interrupted sutures were used entirely in this closure. Finally a solid wall was built up. The skin was now approximated in midline over this with interrupted silkworm-gut. Really an apparently sufficient closure of the bladder, urethra, and fascia had been accomplished. The catheter was fastened in place with silkworm-gut.

Healing was by first intention except along the course of the urethra, where the stitches gave way. The mother was instructed to insert the tip of a syringe into the opening at the base of the penis and to inject water to dilate the bladder. When last seen (April 13, 1928) the boy presented a well-healed linear scar extending from the base of an open urethra up over the bladder. The bladder was entirely in the abdominal cavity, and the bladder capacity had increased to 3 ounces. There existed a partial epispadias. The mother was instructed to continue the dilatation of the bladder and to return with the child in October.

Comment.—By this operation a case of exstrophy of the bladder with epispadias has been reduced to a case of epispadias. I see no reason why a urethra may not be successfully constructed, and a sphincter made for it from the gracilis muscle, as was accomplished in the preceding case. Should these steps fail, the ureters may still be implanted into the rectum, but to have done so, without an attempt at restoring the child to a normal condition rather than the unfortunate one of having him urinate through his rectum, would have been to admit defeat.

CLINIC OF DR. LEROY B. SHERRY

PASADENA HOSPITAL

TWO CASES OF BENIGN INTESTINAL OBSTRUCTION

INTESTINAL obstruction is essentially a surgical condition. Leaving aside for the purposes of this discussion all types of partial or chronic obstruction including carcinoma, we still have a long list of causes of this condition. Acute intestinal obstruction may then be caused by:

1. Foreign bodies, gall-stones, parasites, intestinal calculi, and masses of fecal matter.

2. By bands, either caused by a previous inflammatory condition, adhesions following operations, or the various abnormal bands of fibrous tissue that result from developmental conditions.

3. By internal hernia, as through the inguinal or femoral rings, the foramen of Winslow, hernia into Douglas' pouch, projecting into the broad ligament of the uterus, through the diaphragm.

4. By incarceration of the bowel in slits or holes as in the mesentery or omentum.

5. By peritoneal adhesions, a chronic peritonitis causing constriction of the lumen of the bowel without strangulation. One such case was reported by Welch in 1907 in which a chronic thickening of the wall of the peritoneal covering had caused obstruction by a complete infolding of the mucous lining of the bowels.

6. Due to stricture, tuberculosis, syphilis.

7. Congenital stenosis.

8. Compression by tumors from without.

9. Intussusception.

10. Volvulus.

Taking this list purely as an academic background and fully realizing that I have not exhausted the causes, may I present the history and operative findings in 2 cases of benign acute intestinal obstruction.

Case I.—A man, age twenty-six years, who entered the Los Angeles General Hospital at 6 P. M., July 11, 1924, in such apparent pain that a history was unobtainable except that he had had no bowel movement for two days, that he had been given castor oil which he vomited.

Subsequently from his brother the following was obtained:

As a child he seemed normal, he was well nourished, strong, and played as other children; he was one of thirteen children, eleven of whom are living and well. One died when a few days old; one died of pneumonia at the age of three; at the age of twelve, patient began having attacks of abdominal pain. Pain usually came from two to four hours after taking food and was not relieved by alkalies. The attacks of pain were not constant after each meal, but came at irregular intervals of from a week to two months. Running and exercise often initiated an attack of abdominal pain. While in army service this pain was especially troublesome and his friends used to say that "whenever he got into the guard-house he would bellyache out of it."

The pain was always located at the umbilicus, was severe and cramp like, lasting for two or three hours, followed by a dull ache for about two days. The bowels were always regular between attacks but never moved during an acute attack. This is notable in retrospect, for at the time the boy was first seen and before it was possible to obtain a reasonable history, the boy kept saying that he would be all right if his bowels would move.

The last attack, for which he entered the hospital, and was operated upon, began about 2 P. M. the day before admission. It came on gradually with pain centering at the umbilicus, and was cramp like and grew progressively worse in severity. A normal bowel movement occurred about 8 A. M. on July 10th or thirty-four hours before admission.

The boy was seen on the evening of July 11th soon after his admission and, as has been mentioned, no history could be obtained. He was found in bed lying on his left side, head on his chest, face pinched, knees drawn upon his abdomen, and crying out at frequent intervals—at times almost uncontrollable. His general physical examination was negative except for the abdomen, which was tense, not distended, no visible peristalsis, tympanites, no evidence of free fluid, marked tenderness on the right lower quadrant with spasm and rigidity of the right lower rectus. Temperature 101° F., leukocytes 14,000. Rectal examination was negative. Naturally an acute abdomen was

recognized, though it was my impression that we were dealing with a perforated appendix with peritonitis. (However I mentioned to the intern at the time that I could not link up this diagnosis with the apparent agony the patient was suffering and mentioned the possibility of obstruction.)

As soon as possible the abdomen was opened through a right rectus incision. On opening the peritoneum, evidence of obstruction appeared. The point of constriction presented itself; dependent from this was a greenish sac about the size and shape of a bantam egg; following the band around, the other end was found to arise from a distended portion of the ileum; it was evident then that we were dealing with a Meckel's diverticulum, and going further it was found that this long band had tied itself into a single knot around a loop of ileum in such a way and with such force that the distal free end became gangrenous. It was necessary to cut the band at the ileum and also at the point of constriction before it could be released. The bowels readily returned to normal. The abdomen was closed without drainage and the boy made an uneventful recovery, being discharged from the hospital on July 25th, two weeks later.

Comment.—Meckel's diverticulum was probably first mentioned in the literature by Lavater in 1671, who reports seeing a case of this character in a patient in Paris. In 1701 Ruysch presented an admirable illustration of this malformation. But it is to Johann Friedrich Meckel, known as the younger one of four anatomists all of the same family, comprising grandfather, father, and brother, that we owe our best description of this condition. This he published in 1812.

Meckel's diverticulum is not particularly rare; it is a short wide protrusion which is found springing from the lower part of the ileum in about 2 per cent. of the bodies examined. It is usually about 2 inches long, and generally its end is free, but occasionally adherent to the abdominal wall, adjacent viscera, or the mesentery. Most commonly it is found about $2\frac{3}{4}$ feet from the ileocecal valve, although it has been found as close as 6 inches and as far away as 12 feet. The diverticulum is due to

the persistence of the proximal portion of the vitelline (vitello-intestinal) duct which connects the primitive intestine of the embryo with the yolk-sac. In shape it may be cylindrical, conical, or cord like.

Obstruction with Meckel's diverticulum is usually due to a loop of small bowel being incarcerated over a band, the distal end of the band being adherent. The interest in the case just reported to me lies in the fact that the distal end of the diverticulum was free and of such a length that the obstruction had been caused by a definite knot around the gut.

A comprehensive report of obstruction by Meckel's diverticulum appears in Minnesota Medicine for August, 1923, by Dr. James A. Johnson.

He says that Halstead estimates that in 991 cases of intestinal obstruction collected by various authors, 6 per cent. were caused by this remnant.

He recognizes four ways in which this may be caused:

1. When diverticulum is attached to the abdominal wall, mesentery, or sac which may cause angulation of the bowel, or the small gut may twist itself about the cord.

2. When long or the tip is floating free, in which case it is not infrequent for it to knot itself about the bowel as if carefully tied.

3. Invagination with intussusception.

4. The diverticulum or congenital stenosis may obstruct the bowel.

The most common form is brought about by the constricting band. Wellington collected 326 cases of Meckel's diverticulum, and found 144 obstructed in this manner, 59 by intussusception, and 9 by volvulus.

The author reports 3 cases, the first in which the fibrous band was adherent to the mesentery and a loop of small bowel had become caught; the second in which the band had adhered to the bottom of the sac of a scrotal hernia with angulation of the bowel; and the third in which the fibrous tip was adherent to the small bowel with a resultant intussusception. Two of his cases recovered and he mentions that the mortality is high,

due to the fact that 6 per cent. of obstructions are due to this condition. He makes a plea for a better recognition.

	Per cent.
Porter reports a mortality of	60.0
Halstead	68.1
Berard and Delore	72.3

One case was found reported in the April, 1923 number of the British Medical Journal which simulated appendicitis; the author

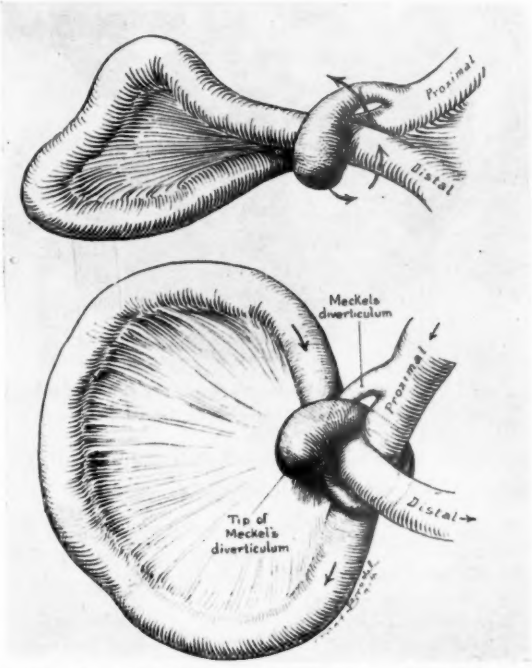

Fig. 563.—Case I. A diverticulum tying off a loop of small bowel. (T. C. Cullen, "Diseases of the Umbilicus.")

made a gridiron incision, found it necessary to make a midline, and makes a plea for a midline incision in acute abdominal cases.

In that admirable book of T. C. Cullen, "Diseases of the Umbilicus," is the report of a case in every way comparable to mine

with wonderful illustrations which I have taken the liberty of reproducing. The way in which the knot was tied and the bulbous tip of the diverticulum are identical, the only variation being

Fig. 564.—Case I. Meckel's diverticulum completely tying off a loop of small bowel. (T. C. Cullen, "Diseases of the Umbilicus.")

in the treatment, for I was fortunate in being able to release the obstruction without resection of the gut.

Case II.—A man of sixty years, who was complaining of pain in the lower abdomen, colicky in character, nausea, and vomiting of four days duration, entered the Pasadena Hospital in February, 1925.

He gave the following history:

Three months previously, while working on a house as a carpenter, stepped on a loose board and fell striking the right side of his abdomen across a scantling; following this he had pain in the abdomen and a marked increase in digestive disturbances which date back into his past history.

After this accident every three to four days the patient would have attacks of pain in the abdomen seeming to localize themselves around the umbilicus. These colicky attacks of pain would last for a few hours and then pass off.

Five days prior to the time I saw him the patient was again at work shingling a house and on bending over had a sudden acute pain in the right side of the abdomen "that doubled him up," however, after an hour was

able to resume work but continued to feel badly during the whole day. That night took an enema which seemed to relieve the discomfort somewhat, the next day, however, still had pain and that night took castor oil, this also seemed to give relief for a short time; the next day was nauseated and had spasms of pain; the day following the nausea continued, and with vomiting of bile the pain still continued more intense in character and of longer duration. The following day he called a physician who discovered a lump in his abdomen; the patient got up and was taken for an *x*-ray. A colon enema was given, which showed obstruction at the site of the mass. No bismuth meal was attempted. The patient was taken to the hospital; during these five days there was no blood in the stools and no bowel movement except as before mentioned with enema.

His past history is of note: Eighteen years ago he had an attack of fever, he says it was never high, which was then diagnosed as typhoid but which

Fig. 565.—Case II. Specimen mucocele appendix. (Drawing by P. S. Doane.)

took patient one and one-half years to recover from; from that time he has had trouble with his digestion, his discomfort localizing itself around the umbilicus. He found that certain foods disagreed, such as apples, raw fruit, cabbage, milk, and fried foods. He was always troubled with gas on his stomach and the aforementioned pains; his bowels were constipated. Prior to his present illness he had no attacks of vomiting, never passed any blood, had had no jaundice.

At the time I saw the patient he was lying in bed on his back in no apparent pain at that moment, his eyes reacted to light and accommodation; he had a few carious teeth; his chest was clear throughout; blood-pressure 140/90; heart was normal in size with no murmurs or adventitious sounds; his abdomen was

the point of interest; there was no apparent distention, but in the midline just above the umbilicus was a visible tumor mass which on palpation seemed to be about the size of an orange which could be moved slightly from side to side and was not particularly tender. There was no visible peristalsis, no evidence of free fluid, no other masses palpable. The spleen was not enlarged; the liver dulness was not increased; rectal examination was negative.

Urine.—Specific gravity, 1.021; albumin, none; sugar, none; casts, occasional hyaline.

Blood.—Red blood-cells, 4,500,000; white blood-cells, 8200; hemoglobin, 80 per cent.

x-Ray.—As mentioned.

The supposition was that we were dealing with an obstruction caused by malignancy, probably in the transverse colon; operation was performed for relief. Fortunately the abdomen was opened through a right rectus incision; no free fluid was found; the transverse colon with this palpable mass was easily brought into the wound, where it was found that the outer coat of the colon could be slipped back and forth over the mass, which instead of being hard was resilient to the touch; after a little manipulation it was found that the mass within the colon could be moved toward the right. The right iliac fossa was then palpated, and an absence of the cecum noted; it was then determined that we were dealing with an intussusception which was easily reduced. The cecum was brought into the wound and the specimen which I now show you replaced the appendix. Fortunately, the edematous tissue did not involve the ileocecal valve and it was possible to remove the appendix with only a small part of the cecum. This man also made an uneventful recovery and is well.

Comment.—I have seen a good many different types of appendices, including two small mucous cysts at the tip, but it has never been my fortune to have met one of this character before. Pathologically it is a retention cyst or mucocele. This specimen measured 9 × 3.5 cm., was filled with a clear mucoid-like material, and microscopically is not malignant.

An excellent description of this type of appendix is given in Kelly's "Vermiform Appendix" under the term "retention cyst." The size and position of the cyst, he says, are dependent on the point of constriction whether at Gerlach's valve or distal to it. They are usually cylindrical in shape and vary from the size of a lead pencil to 1 to 3 c.c. Sonnenberg refers to one 14 cm. in length and 21 cm. in greatest circumference. Virchow describes an appendix which was as large as a fist and Elbe refers to one removed from a woman of fifty-two which was as large as a child's head 5.2 × 7.2 inches.

Pathologically it begins by an occlusion at some point in the appendix with a mucous discharge which becomes watery and later mucoid. Adhesions on the peritoneal surface are rare.

With reference to the rôle the appendix plays in intussusception we glean the following from Vol. VI of Keen's Surgery in 1911, Moschowitz gave the details of a personal case, and states that it is the only one observed in 500 cases of appendicitis at the Mt. Sinai Hospital in the eleven years preceding.

There are three types:

1. Partial intussusception. There were up to 1913, 8 cases of this type recorded.

2. Total intussusception in which the whole appendix is inverted like the finger of a glove, 7 cases reported.

3. In which the appendix acts as a foreign body, finally resulting in ileocolic intussusception, 16 cases.

Spurney and Nyquist reported one case in the Ohio Medical Journal for 1922, this I have been unable to secure.

M. H. Biggs, in Surgery, Gynecology, and Obstetrics for November, 1921, also reports cases due to tumors.

In the British Medical Journal for October, 1924, J. Gayme Jones in an article on the general subject of intussusception states that "it is interesting to note that a pathologic condition of the appendix is but seldom to be found as the cause of the trouble," mentioning only one case of intussusception of cecum, appendix, and $1\frac{1}{2}$ inch of the ileum. This was reduced and an appendix 4 × 2 inches with the distal end containing fluid, the lumen obliterated proximally, was removed.

Mechanical pathology always interests me—the "why" of a condition. Probably this man's pathology dates back to his attack eighteen years ago. His digestive troubles were undoubtedly caused by the appendix which has lain latent for a long time. An injury sufficiently severe in character and force applied at just the right angle against the tip of this unyielding appendix was all that was necessary to initiate an invagination of the ileum and cecum. I cannot but feel that this occurred at his second injury when he noticed the acute pain on bending over. Could not the tip of this appendix impinging on the pelvic wall have initiated the intussusception and the castor oil have added the finishing touch?

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CLINIC OF DR. REA SMITH

HOLLYWOOD HOSPITAL

A CONSIDERATION OF GALL-BLADDER SURGERY

GALL-BLADDER surgery during the past ten years has seen the swing of the pendulum wide in each direction from the center of conservative and reasonable treatment of infection. Ten years ago in the larger clinics, where the policy of gall-bladder surgery is molded, the cases ran 80 per cent. drainage and 20 per cent. removal. Because of a failure of symptomatic cure, between 5 and 10 per cent. of the patients treated by drainage for all types of gall-bladder disease, the pendulum has swung back, so that three years ago in the same clinics the proportion of removal was 90 and the drainage 10. Removal of the infected gall-bladder has undoubtedly cleared up the symptoms for which the patient was operated upon in a larger percentage of cases than the simple drainage.

In the past two or three years a new type of surgery of the biliary tract has come into prominence, that of common duct obstruction without stone, and without new growth. This difficulty following cholecystectomy has necessitated a secondary operation, which has proved very difficult of performance, and to have a very high mortality. In all of these cases that I have had an opportunity of studying the foramen of Winslow has been closed. The lumen of the common duct has been obliterated in more or less its entire length by a secondary contraction of the inflammatory exudate surrounding it. In view of the fact that the removal of the gall-bladder is likely to be followed by a complication so serious that it necessitates a life-saving operation, while the secondary operation for drainage is simple, and not attended with a high mortality, the question arises, whether

or not more care in the selection might not be used in those cases to be drained and those to be removed; or, perhaps a change in technic in the gall-bladder removal, which would prevent the loss of the normal support of the common duct, and the collapse of the foramen of Winslow, and so hold the common duct out of the lake of plastic lymph that collects in the fossa, between the right kidney and vertebral column so that this obstruction would not occur.

The steps in the ordinary technic in the gall-bladder removal is a familiar one, whether done from above or below. The cystic duct is isolated, ligated, and dropped back. The cystic artery with its surrounding tissue is ligated and dropped back. The gall-bladder is removed from its attachments to the liver and the raw surface covered over. It occurs to me that the isolation and the dropping back of the cystic duct takes away the normal support of the common duct, and allows the common duct to lie slack against the posterior peritoneum in the edge of the lesser omentum. The common duct is, therefore, lying in more or less of a pool of plastic lymph, and is surrounded by a thick membrane, which slowly contracts until the lumen of the duct becomes partially or wholly obliterated. This process is a slow one and our bad results do not become urgently manifest for a period of several months to two or three years, so that the benefit by a change of technic must, of necessity, be very hard to prove. However, in face of the fact that common duct surgery after cholecystectomy is becoming more and more necessary, and the constant finding of the inflammatory obliteration of the duct adherent to the posterior parietal peritoneum, is to my mind, justification for an attempt to leave the support of the common duct undisturbed in the removal of the gall-bladder. In many cases it is a very simple procedure to cut the peritoneum of the gall-bladder parallel to its attachment to the liver on either side, and from above downward peel out the gall-bladder mucous membrane to the cystic duct. The cystic duct is then ligated, without isolating it from its surrounding tissue, below the point of ligation, so that the stump of the cystic duct has the same support through its attachment to the

liver by the tissue intervening, that it had from the gall-bladder attachment to the liver. This support can be regulated by the ligature or sutures between the stump of the duct and the liver. In cases in which the wall of the gall-bladder is so thickened that it cannot be peeled from the liver in the manner described above, a peritoneal cuff is made from the lower anterior surface of the gall-bladder continuous with the peritoneum of the cystic duct, and this cuff is stitched to the denuded surface of the liver. Either one of these procedures does not lengthen the time of the gall-bladder removal, or add to its danger, and, except in the short, fat patient, with deep contracted gall-bladder, is of easy performance.

It seems to me that three distinct elements enter into the problem of selection of operation. They may be alone or in any combination. Usually all three are present in the same case. They are:

1. Mechanical obstruction of biliary passages.
2. Infection of gall-bladder walls.
3. Infection of liver ducts.

The mechanical obstruction unaccompanied by active infection, of course, is simple, because it must be relieved mechanically, and the operator chooses the way that is easiest for him to do.

No one will contend that the grossly infected gall-bladder wall should be left under any circumstances that would permit of its removal.

In the presence of the third condition I think that whatever is done, drainage of the liver ducts must be a part of the procedure.

This sounds very simple if these conditions would occur singly, but in the nature of the development of gall-bladder disease it is almost impossible to have a gall-bladder condition demanding operation which does not have a combination of at least two of the three elements.

McArthur and Lobingier have reiterated for years the fact that the diseased gall-bladder is only a small part of the general infection of the biliary tracts, and that as a routine operation

(if a routine operation is to be used) one that drains the bile-ducts will effect a cure in a larger percentage of cases than one in which drainage is not considered. I am sure that they are right in this, and I am also sure that many different surgical shifts may be used to accomplish a removal of the infected gall-bladder wall and drain at the same time, so that it will not be necessary to make a flat choice between cholecystectomy and cholecystotomy.

I should like to mention a change in method of separating the gall-bladder from the liver that not only seems to make the removal technically much easier, but also leaves the liver surface smooth, avoiding the necessity of any sewing to cover denuded surfaces. I am in a quandary whether to call it the hydraulic method or the method of infiltration dissection; either describes it. A 10-c.c. syringe full of salt solution is injected between the gall-bladder and the liver under the reflexion of the peritoneum, which immediately balloons. Upon dividing the peritoneum, the gall-bladder is found to be separated entirely from the liver, except for the peritoneum on either side, which is divided without oozing. The solution under tension seems to separate the two structures in the normal plane that a knife or blunt dissection will not follow, and it has been a great surprise to me to see how easily the old bladders adherent from chronic or repeated attacks of inflammation remove themselves with the judicious use of a little fluid.

CLINIC OF DR. GEORGE W. SWIFT

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THREE CASES OF SPINAL CORD TUMORS

THE differential diagnosis and localization of a spinal cord tumor may at times offer difficulties. It is for this reason that I am presenting *three* interesting *cases of tumors of the spinal cord and its membranes.*

Case I.—The first case brings up the question of atypical disseminated sclerosis, spinal type, or tumor of the spinal cord.

June 14, 1927, King County Hospital. C. G., white male, single, twenty-seven years of age; operated at the Swedish Hospital for pain in the upper abdomen, appendix removed but no relief from pain. Operation December, 1927.

Duration of Disease.—First symptom—pain in the back and upper abdomen, two years ago. Progress of symptoms—pain not constant. At times it was very sharp and began in the back, between the shoulder blades, and "bored through into the upper abdomen." Several months after the onset of the pain, patient began to notice that his legs were getting stiff and weak. This gradually increased, together with a feeling of numbness, beginning in the legs and extending up to the chest. His condition slowly progressed until he was unable to get about. Six months ago he became bedfast and has since been unable to get out of bed. During the last year, he noticed an increasing constipation.

Physical Examination.—A pale young man, totally bedridden. Abdomen shows a healed right rectus incision; he is unable to move his legs. Definite sensory disturbances for light touch and pin prick up to 3 inches from the nipple line in front and through the third thoracic spine posteriorly. Trophic changes about the toes and over the sacrum. A fine lateral nystagmus and pallor of the disks. Motor and reflex disturbances—abdominal reflexes cannot be elicited; cremasters present; patellar and tendon Achilles reflexes 4 plus; bilateral foot drop; spastic lower extremities; bilateral ankle clonus and patellar clonus. Babinski, Oppenheim, and Gordon signs are positive on both sides. Sensory disturbances—diminished tactile, pain, and temperature sensibility below the fifth thoracic segment. Loss of vibratory

sensibility bilateral from the toes to the seventh rib anteriorly and diminished below the third thoracic spine posteriorly. Slight sensitiveness to pressure on the fourth thoracic spinous process. Chronic constipation; delayed micturition.

Laboratory Studies.—*x*-Ray of the spine, anteroposterior and lateral positions, shows no bony abnormality. The lumbar puncture in the prone position, forth interspace, gives a pressure of 30 mm. with a mercury manometer. Eight c.c. of cerebrospinal fluid removed; fluid amber tinted; pressure dropped from 30 mm. to 0. Queckenstedt's test positive. Deep breathing elevates the pressure to 30 mm. Withdrawal of 7 c.c. of cerebrospinal fluid resulted in a stoppage of the flow. With an aspirating arrangement 5 c.c. of fluid were removed and 10 c.c. of air insufflated. Five c.c. of air returned to the syringe under considerable pressure.

Serologic report shows twenty lymphocytes in the cerebrospinal fluid; positive globulin; negative Wassermann.

Summary of the Case.—We have here a history of pain in the back and upper abdomen, two years' duration; constipation; paresthesia, and paralysis of the spastic type in both lower extremities; positive signs of compression of the spinal cord at about the level of the fifth thoracic segment. There is also pallor of the disks and fine lateral nystagmus. The Queckenstedt test is positive and the cerebrospinal fluid is amber colored; there is lymphocytosis and increased globulin. The *x*-ray does not show any bony changes.

We must consider from a differential diagnostic standpoint extradural spinal cord tumor, extradural tuberculoma, and the spinal type of disseminated sclerosis with possible arachnoid and dural adhesions, giving us a subarachnoid spinal block. The probable diagnosis, however, is extradural tumor at about the level of the fifth thoracic segment, probably posterior.

Operation.—Exploratory laminectomy, June 25, 1927, at the King County Hospital, Seattle, Washington. The back was prepared by cleansing three times with soap, gauze scrub, and water; two applications of alcohol; and the entire field treated twice with an alcoholic preparation of mercurochrome, 2 per cent.; drapes applied. Incision from the third thoracic spine to the twelfth thoracic spine outlined. Skin incised and bleeding controlled. Muscles and fascia separated from spinous processes, and bleeding controlled by hot gauze packs. Interspinous liga-

ments severed, spinous processes removed. Palpation within the incision revealed a firm, globular mass to the left of the midline, between the third and fourth thoracic vertebral arches. On retracting the incision and exposing the mass it was found to be a globular, bluish, firm tumor, extruding between the third and fourth thoracic arches. A thin pedicle extended inward. Removal of the third and fourth vertebral arches revealed a smaller tumor within and firmly adherent to the dura, the latter thickened, and no pulsations visible or palpable. There were slight osteomyelitic changes in the vertebral arches above and below the tumor. On manipulating the tumor it ruptured, revealing a soft, reddish, granulomatous material. The tumor was easily removed. A thick fibrous membrane was dissected off the dura and the dura beneath this fibrous membrane was normally bluish and pulsations were visible.

Pathologic Report.—Fibromyolipoma of inflammatory origin.

Subsequent Report.—Four days following the operation the patient was able to detect sensation in the lower extremities. There was a gradual return of all the modalities of sensation beginning in the feet and gradually extending up toward the chest. The return of motor power has been somewhat slow, but at the present time the patient is about the ward in a wheelchair and is able to walk with the aid of a cane. There is no pain and the incision is healed. May 9, 1928 patient is able to walk about and operates an elevator for six hours each day.

Case II.—The second case which I will present to you is complicated by a severe anemia. The outward appearance of the patient, together with several blood-pictures, at once aroused the question as to whether or not we were dealing with pernicious anemia.

October 31, 1927, Providence Hospital. Mr. O. T., white male, married, sixty-one years of age, suffered from pain in the left shoulder, general weakness, constipation, and stiffness of the legs for about two and a half years.

Duration of Disease.—First symptom—pain under the left shoulder blade, beginning about two and a half years ago. Six months later noticed weakness of both legs and stiffness. Observed that when walking had a peculiar springy sensation in the feet. Progress of symptoms—the stiffness and

weakness gradually increased, the pain was more or less constant and always localized in the original site, always on the left side, radiating invariably into the region of the shoulder, especially under the shoulder blade and into the left side of the chest. During the last year the pain extended down into both legs, especially noticeable when getting up in the morning. Pain slightly influenced by sneezing, coughing, or straining and possibly exaggerated during damp weather. When in bed, both legs jerked and had a tendency to draw up. He denied sphincter disturbances or any disorder of sensation. Condition progressed until it was impossible for him to walk unless assisted.

Fig. 566.—Providence Hospital. (See record of Case II.)

Physical Examination.—An emaciated, sallow looking, elderly man. Color is of long standing, according to his relatives. Gait slow, scraping, and of the spastic paraplegic type, shoes worn equally on the toes. He has to be assisted in walking and is unable to help himself. Legs are extremely stiff. His facial expression denotes long standing suffering and pain. The muscles are soft and flabby. General physical examination discloses nothing

indicative of malignancy. The blood shows 50 per cent. hemoglobin, 3,100,000 red cells, 10,600 white; 79 per cent. polymorphonuclear. Motor and reflex disturbances—extreme weakness and stiffness of both legs, to the point of spasticity, from the hips to the ankles. Patellars and tendon Achilles are equal, about 4 plus. There is a bilateral ankle clonus, bilateral Babinski and Gordon. The abdominals and cremasters are absent. Atrophy of both arms, forearms, and hands and the intrinsic muscles of the fingers show some slight atrophy in the left hand. Grips are weak, especially the left, he is right handed. Sensory disturbances—diminished tactile, pain, and temperature and deep sensibility, up to and including the third thoracic segment, a trifle higher on the right side. Absent vibratory sensibility from the toes to the anterior superior spines of the ilium. No local sensitiveness of the vertebral spines to be demonstrated. Vibratory sensibility diminished below the fourth thoracic spine. Sphincter—chronic constipation.

Laboratory Studies.—Lumbar puncture, sitting, fourth interspace. Pressure 30 mm. with a mercury manometer. Five c.c. of cerebrospinal fluid withdrawn, fluid colorless. Second specimen canary yellow color. Ten c.c. of air insufflated. Patient experienced severe pain radiating into the left shoulder and chest wall, unable to feel air in the cerebral ventricles. Queckenstedt's test positive. *x*-Ray of the skull and spine showed no air in the ventricles and a tracheal shadow overlay air in the spinal subarachnoid space.

Serologic.—Spontaneous coagulation of the fluid on warming. Cells 2. Wassermann negative.

Summary of the Case.—Pain in left shoulder and chest walls for about two and a half years, gradually increasing stiffness and weakness of both legs. Chronic constipation. Severe anemia. Neurologic findings of spinal cord compression in the upper thoracic segment. Positive Queckenstedt test.

Differential Diagnosis.—Pernicious anemia, with spinal cord degeneration. Malignancy, with metastasis to the spinal cord. Spinal cord tumor, extramedullary.

Probable Diagnosis.—Extramedullary tumor of the spinal cord at about the level of the second and third thoracic segments, probably on the left side.

Operation.—The first stage of an exploratory laminectomy was preceded by a direct blood transfusion. About 500 c.c. of whole blood was given. First stage laminectomy, Providence Hospital, November 3, 1927. Usual preparation, back cleansed with soap and water three times, alcohol applied twice, two applications of mercurochrome. Incision outlined from the seventh cervical to the fourth thoracic, drapes applied. Skin incision

made and bleeding controlled. Muscles and fascia separated from the spinous processes, spines removed, and vertebral arches rongeured out. Considerable bleeding occurred at this stage, which was partially controlled by hot packs, the muscles being soft and pliable. On exposure of the dura there were no visible pulsations or palpable masses. The dura was opened and in the upper angle of the incision the tumor was seen, just above a ballooned-out pocket in the arachnoid. At this stage of the operation the patient's condition became somewhat serious and there were signs of impending shock. The incision was closed and the patient left the table in fair condition after stimulation and 1000 c.c. of Ringer's solution given subcutaneously.

Second stage, November 10, 1927: Alcohol and tincture of iodin preparation; incision extended up to include the fourth cervical. Dura opened, normal pulsations above, with no pulsations below, and what seemed to be a definite bulging of the arachnoid. Under the ballooned-out arachnoid an oblong, yellowish tumor could be seen about the size of a lima bean. This was lying on the left side of the spinal cord, just under a spinal sensory root and was identified as the third thoracic sensory root. The arachnoid was perforated and what appeared to be an accumulation of cerebrospinal fluid was found to be the air which had been insufflated for diagnostic purposes. The tumor mass was easily shelled out from its capsule and removed, with the exception of a small portion of its pedicle; this was adherent to the root on the left side. The incision was closed and the patient left the surgery in good condition.

Pathologic Report.—Perineural fibroblastoma.

Subsequent Course.—Convalescence has been slow. The spasticity rapidly cleared up and the sensory defects are now almost imperceptible. He has had a second transfusion. Has been on the Murphy-Minot diet. The blood-picture, on leaving the hospital, showed hemoglobin, 44; red blood-cells, 2,880,000; white blood-cells, 23,600. The wound has healed nicely and the patient is free from any pain. The last hemoglobin estimation, December 24, 1927, shows 50 per cent.

Case III.—The third case in this series of tumors of the spinal cord is one of extreme interest for the reason that we were at a loss for some time to make an accurate localization of the neoplasm. After several careful neurologic examinations we decided that the tumor, in all probability, lay at the level of the tenth thoracic segment, probably on the left side and slightly anterior. You will observe that there were no motor or sensory disturbances in this case. Summary of the case follows:

April 2, 1928, J. K., age forty-four years; chief complaint is pain in the left side; this began about March, 1927, when he noticed severe pain in the back and upper abdomen, which seemed to radiate around to the left side, just under the lowest costal margin.

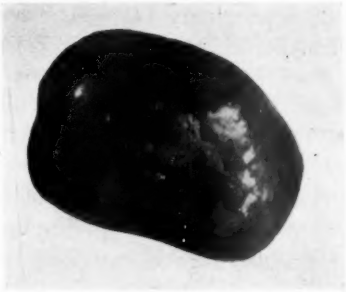

Fig. 567.—J. K., Virginia Mason Hospital. Spinal cord tumor. (See history of Case III.)

Duration of Disease.—First symptom—in March, 1927, patient had severe pain in the back and upper abdomen, which seemed to radiate around to the left side. Progress of symptoms—pain became more severe; was seen by several physicians and chiropractors, with no relief. Unable to sleep on account of the pain in the back; slightest jar caused pain in the spine, sharp pain on the left side.

Examination.—A thin, undernourished, and underdeveloped white male; walks with typical gait of spinal cord tumor patient, holds his back stiff, treads lightly and seems to list a little bit to the left side. Motorium—normal throughout. Sensorium—no disturbance to light touch, deep sensibility, or vibratory. There is some tenderness over the tenth thoracic spinous process; slightly lessened bone conduction below this point. Deep reflexes—left slightly greater than the right; tendon Achilles about equal; abdominals brisk but equal; cremasters equal and react normally; plantars sensitive; suggestion of left Babinski; left ankle clonus, right ankle clonus

suggestive. Slight fibulary twitchings of the muscles in the lower extremities and of the intercostal muscles, chiefly on the left side, especially in the lower intercostal spaces.

Lumbar puncture was made, spinal fluid was yellow, coagulated spontaneously; cell count—38 lymphocytes; sugar 53 mg.; Wassermann negative.

Following the lumbar puncture the patient complained of more pain on the left side, at the level of the left lower rib. Following these studies the patient went to an eastern clinic, andupon his return to Seattle, March 12th, he began to complain bitterly of pain in the left side, difficulty in walking because of the sensitive spines.

Summary of the Case.—History of severe pain in the back, radiating into the left side, one year's duration. Negative motor and sensory findings. Questionable pyramidal tract and reflex disturbances; slightly tender tenth vertebral spinous process, diminished vibratory sensibility below. Patient's general condition anemic, undernourished, worn-out from lack of sleep. Spinal fluid findings strongly suggestive of tumor. In the east it was thought that the patient might be suffering from a retroperitoneal tumor with metastasis into the cord. His general condition suggested the possibility of this condition. However, it was considered that he was probably suffering from a spinal cord tumor, extramedullary, lying opposite the tenth thoracic segment, possibly slightly anterior. On these findings, an exploratory laminectomy was recommended.

Operation.—Exploratory laminectomy, Virginia Mason Hospital, April 2, 1928. Patient was placed on his face, the table elevated in the middle so that the back was given a slight angulation in the middorsal region. The seventh cervical spinous process was identified, blue penciled, and the twelfth dorsal likewise identified. Slight tenderness over the tenth dorsal spinous process identified and a mark made about 2 inches proximal to this with a blue pencil, roughly localizing the probable location of the tumor. The back was cleansed twice with gasoline over the entire posterior surface; three applications of alcohol were then used and two light applications of tincture of iodin. Incision was outlined extending from the twelfth dorsal spinous process to about the fourth dorsal spinous process; towels and drapes applied. The skin incision was made and

bleeding controlled with hemostats and Andrews' clips. Skin towels were then placed and the muscles severed from the spinous attachments on either side, working from above downward and separating first on the left side, then on the right, and packing with long strips of gauze wrung out of hot Ringer's solution. The interspinous ligaments were then severed, the self-retaining retractor inserted in the upper and lower angles of the incision, and the spinous processes then removed. The arches of the vertebræ were removed with the rongeurs, making an exposure from about the twelfth dorsal to the seventh dorsal spines. After removing the arches of the vertebra, and running the finger along the exposed posterior wall of the dura, pulsations were felt above and below, but there was a hard, globular mass palpated just opposite the space between the sixth and seventh spinous processes. The sixth spinous process and arches were then removed and it was seen that we were dealing with a firm, intradural tumor. All bleeding controlled with hot packs. Cotton padding was placed around the incision, walling off all muscle areas, the trough on either side was dried, the dura incised, and the incision carried above and below with right angle scissors. Four tension sutures were placed in the cut margins of the dura and in the upper angle of the wound a round, pinkish tumor was seen lying to the left and somewhat anterior to the spinal cord, just opposite the sixth and seventh vertebral bodies, placing it in the region of the ninth and tenth thoracic segments. The posterior root of the ninth thoracic segment passed above and in front of the tumor, while the tenth thoracic root passed below the tumor. The spinal cord was pushed to the right and the left lateral surface flattened and distinctly grooved by the tumor. Below the tumor the posterior spinal vertebral vessels were varicosed. The arachnoid below the tumor mass ballooned out and had the appearance of a jelly-like substance within its meshes. The arachnoid was nicked and there was an immediate gush of cerebrospinal fluid. Working away from the spinal cord, the tumor was easily shelled out by nicking its capsule. There was no bleeding. The pedicle was dissected down, the root was ligated above and below, and the tumor removed without diffi-

culty. Slight capillary oozing was then controlled and the dura was closed with a continuous linen suture, bellies of the cut muscles approximated, the fascia sutured with interrupted sutures 1 cm. apart; all bleeding controlled. Fine black linen sutures inserted 1 cm. apart closed the subdermal layer. The final closure was made with straights 1 cm. apart, margins of the wound treated with tincture of iodin, dressings applied, and a thick padding with adhesive tape completed the dressing.

Following the operation the patient had complete relief from pain. He improved rapidly, and was seemingly making very good progress until April 9th, when he suddenly developed symptoms of pneumonia in the right chest. This was considered as a possible embolic pneumonia, was treated as such, and he gradually improved, but on April 13th, early in the morning, the pulse suddenly became very rapid and irregular, and signs of a pontile embolism made their appearance. He developed ptosis of the right lid, paralysis of the left side of the face, pyramidal tract signs, and had difficulty in deglutition and respiration. The pupils were small, almost pin-point contraction, and he was considered to have suffered from a pontile embolus. He rapidly developed coma and died in the afternoon. Postmortem could not be obtained.

Comment.—These cases demonstrate the value of a carefully taken history. In each case the onset was characterized by pain. This was of great value in giving us a leading clue as to the probable site of the tumor. In the third case it was very important inasmuch as the manometric tests did not show a positive spinal subarachnoid block, and there were no sensory or motor disturbances. Had it not been for the careful elicitation of the initial root pain, together with the other signs and findings from which the localization was made, in all probability we could not have accurately localized this tumor.

The second point of interest is that in each case the cerebrospinal fluid was amber colored. There was an increase in lymphocytes in Cases I and III, a fairly common occurrence in spinal cord tumors. The Queckenstedt test was positive in Cases I and II, and negative in Case III. In the latter one we had a

very marked xanthochromia and spontaneous coagulation of the cerebrospinal fluid, yet were unable to demonstrate a positive Queckenstedt, and the air which was insufflated traversed the spinal subarachnoid space and entered the ventricles. In the second case an insufflation of air was made, and this demonstrated root pain and spinal subarachnoid obstruction, the patient complaining of pain in the left shoulder and down the arm into the fingers.

CLINIC OF DRS. ALANSON WEEKS AND G. D. DELPRAT

ST. LUKE'S HOSPITAL, SAN FRANCISCO

ARTERIOMESENTERIC OCCLUSION OF THE DUODENUM

THIS patient is a Scotchman, age thirty-four years. He is an engineer. He comes complaining of stomach trouble which he has had for the last four years, previous to which time he had been entirely well. His chief symptom is pain, occurring two hours after eating and relieved by food and alkalies. He has had definite remissions. One year ago, while in Sacramento, he had an acute attack of extreme abdominal pain, with vomiting. His pain was so severe and his belly so hard that there was no question about the diagnosis of a perforated ulcer of the stomach. He was operated by Dr. von Geldern, who found perforation in the first part of the duodenum. This was excised with a longitudinal incision and sutured transversely after the manner of a Horsley pyloroplasty. He had a rather stormy convalescence which lasted about two months.

Following this he was well and could eat anything that he wished until about two months ago when the pain returned and he, himself, went on a milk diet. He did fairly well as long as he stayed on this diet, but any indiscretion was accompanied by pain, nausea, and vomiting.

He came to Dr. Cooper's office for examination, and there three pulpless teeth, infected tonsils, and intranasal disease were discovered. The teeth were removed as being a possible source of infection. Analysis of the gastric juice was made but the acidity was low, both of the free and combined acid. There was no occult blood in the stools. Gastro-intestinal series showed a small gastric residue and a constant, punched-out deformity through the middle third of the duodenum. The cap was reported as normal size. The conclusion was ulcer of the duodenum. The patient was put on an ulcer diet for about ten days with very little relief.

In view of the past history which is so typical of an ulcer, and in view of the perforation which is known to have occurred, we feel that the diagnosis of duodenal ulcer is very probable, especially since this patient had been allowed to retain teeth which so frequently are a source of infection that may be responsible for ulcers of the stomach and duodenum. More than once patients have come to our office complaining of stomach

trouble, and are referred to a dentist for tooth extraction, and we find that their ulcers get well without operation.

This patient's symptoms, however, have persisted and he has not improved on an ulcer diet. There is no question about the deformity of the duodenum as seen in the *x*-ray, and knowing that there has been operative interference in this region, we must consider postoperative adhesions as being the cause of this man's symptoms. Last year we reported a series of cases in which abdominal adhesions had been the cause of very definite symptoms. One of these cases had a typical ulcer history and had been diagnosed by a most competent internist as having a duodenal ulcer. He had a constant defect of the duodenum which was shown on three successive roentgenologic investigations, but when he was operated upon only a fiddle-string adhesion in the region of the duodenum was discovered. His symptoms were immediately relieved upon cutting this adhesion.

As we see this patient, he is of long, slender build. His musculature is not very heavy. He might be called an asthenic type, although his work is fairly heavy. These people are often visceroptotic, and we have had patients before of this type in whom the mesentery of the intestine pulls across and occludes the second or third portion of the duodenum. They are more apt to have symptoms of obstruction with distention of the stomach after meals, pain, and headache. These patients frequently learn that by pulling up on the abdomen with both hands below the umbilicus, or by lying down, their symptoms are relieved. When they lift up on the mass of intestine the tension on the mesentery is released and the gas and food are allowed to pass on. This patient has not noticed that his pain is relieved by lying down, and vomiting has not been one of his prominent symptoms.

We will now make a high, right rectus incision. The fat is very small in amount. The rectus muscle beneath is very poorly developed and we have no difficulty in pulling the fibers away from the midline. The peritoneum is opened without difficulty and immediately below is the large stomach. The stomach is definitely dilated and the wall as we pick it up appears thicker

than normal. There is evidently some hypertrophy of the stomach muscle. There are a number of string and band-like adhesions in the region of the duodenum which bind the duodenum to the region of the gall-bladder and even to the free edge of the liver. Some of these are cut between ligatures, others can be pushed aside with a sponge stick.

The antrum, pylorus, and duodenum are now freed. We do not see the pyloric vein and, in fact, the whole pylorus and first part of the duodenum is greatly dilated. On feeling along the region where the pylorus should be, there is a little thickening and induration. This is the greatly dilated pylorus, and right next to this region is a little pale area which had been covered by adhesions and was probably the site of the former perforation. It is not indurated now.

Even though there are a number of adhesions, it is remarkable that there are not more. Looking under the omentum and colon, we see that the dilatation is carried down to the second portion of the duodenum, but the jejunum is collapsed. On passing the finger below the jejunum and toward the right side one may pick up the mesentery. This is almost without fat and drags down in a rope-like cord across the transverse portion of the duodenum. We may raise it without difficulty and immediately gas runs through into the jejunum. It is perfectly evident that here is the cause of an obstruction and we are surprised that the patient has not had more vomiting.

Various operations have been suggested to remedy this condition. The one that is probably the most popular is that of a duodenojejunostomy, which was devised by Staveley in 1907, and consists of bringing the jejunum over either above or below the transverse mesocolon and anastomosing it to the dilated portion of the duodenum. This operation is not without danger, however, for occasionally the obstruction may continue due to angulation at the site of the anastomosis.

In this case we prefer to perform a posterior gastro-enterostomy on account of known former ulcer. We will now make our small incision in the transverse mesocolon and push through it a portion of the posterior surface of the stomach near the py-

lorus, and holding it in a stomach clamp, will now select a loop of jejunum and hold it in a clamp in apposition to the former. It is important to have the intestine isoperistaltic. We use a fairly long loop. Recently we had occasion to take down a posterior gastro-enterostomy for a marginal ulcer, and the trouble and difficulty we had at that time owing to the use by another surgeon of an extremely short loop have decided us always to use a long loop.

We have now completed the anastomosis and anchored the stomach to the opening in the mesocolon. You notice that there is very little fat in the abdomen. These cases of arteriomesenteric ileus, if taken when the symptoms are still mild, are often cured medically by fattening the patient. When the mesentery is filled with fat there is more support to the intestine and less danger of occlusion of the duodenum.

Another operation that has been devised by Kellogg is the support and fixation of the hepatic flexure of the colon and the cecum as a means of relief of the enteroptosis. In this patient, however, we doubt whether such a procedure would be of value. The pathology which we have here has been blamed for acute dilatation of the stomach with all the symptoms that that includes, whether postoperative or after a meal.

We now close the abdomen without drainage and the patient will be sent to his room in good condition.

Postoperative Course.—Following operation the patient had a moderate amount of hemorrhage from some small vessel which had apparently leaked at the site of the anastomosis. He was kept perfectly quiet and fluids withheld, under which treatment the hemorrhage soon stopped. In thirteen days he was able to leave the hospital. Two months following his discharge from the hospital he reported to our office. He had been kept on an ulcer diet as a precautionary measure and had gained 5 pounds in weight. He felt very well and had no distress after eating. He was told to gradually start eating normal food again and to take plenty of exercise.

CLINIC OF DR. JOHN HOMER WOOLSEY

UNIVERSITY OF CALIFORNIA HOSPITAL

GASTROSTOMY

GASTROSTOMY may be made a more simple procedure for the surgeon and less incapacitating to the patient. This same technic has undoubtedly been employed by others, and Binnie[1] describes a somewhat similar operation, yet no harm will come from reiteration and description of an excellent but, apparently, forgotten method. At the University of California Clinic we have for some time employed with great satisfaction the mushroom or so-called Pezzer's self-retaining catheter in several procedures, among which is gastrostomy. The use of this type of catheter and a technic according to Stamm[2] comprises the method. It is performed as follows:

Under local anesthesia a 6-cm. incision is made in the upper part of the left rectus muscle. After entrance to the peritoneal cavity, the anterior wall of the stomach in the midfundic portion, or even more proximal, and midway between the lesser and greater curvatures, is picked up by an Allis forceps. About this point three separate concentric "purse-string" sutures of absorbable material are placed, allowing the ends to be located at different points of the circle. An incision is then made into the stomach and digital exploration, or direct view by an endoscope, employed if desired. A mushroom catheter, F. 24–27, is then passed into the gastric opening and drawn back so as to fit snugly against the gastric wall. The "purse-string" sutures are separately tightened about the gastrostomy tube and tied. As each suture is tightened invagination of the stomach wall about the tube automatically takes place. The stomach is

then attached to the parietal peritoneum by two interrupted sutures of "B" silk so placed as to include both edges of the laparotomy wound and assist in closure of the peritoneum and posterior rectus sheath. A portion of omentum is placed about the gastroperitoneal junction, and then the remaining wound closure effected. A rubber cuff, previously slipped over the catheter, is now adjusted to the skin level and by means of a

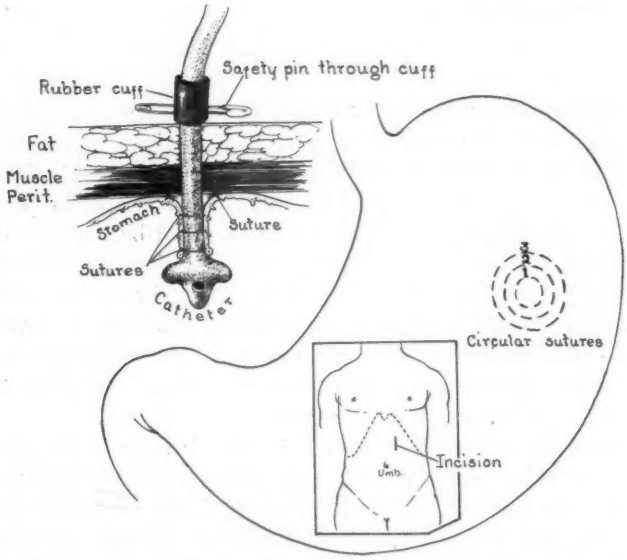

Fig. 568.—Gastrostomy according to Stamm, with employment of a mushroom type of catheter.

safety-pin through the rubber cuff and adhesive is held in place. The patient is allowed to be up and about the following day and to leave the hospital in two to five days.

The advantages to the surgeon are an easy procedure under local anesthesia, the definitely known length of tube into the stomach, the assistance in holding the stomach against the parietal wall for attachment, and less leakage eventually than by the original Stamm or the Witzel methods. The advantages

to the patient are less incapacitation and less pain, due to the fact that ordinarily a great length of tube is left in the stomach undoubtedly reaching the pyloric canal or even the pylorus itself. Eventually, if desired, the catheter can be easily extracted, or a new one easily inserted by the use of an obturator.

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RADICULITIS IN RELATION TO ABDOMINAL LESIONS

RADICULITIS is a symptom-complex manifested by alterations of sensation or motor function which show by their distribution that the disease process is in the spinal root.[1] Pain is the complaint.

Pain, more often than any other subjective symptom, brings a patient for consultation. Pain is a commonly understood and a commonly used term and yet many people employ other terms synonymously, such as "aching," "distress," "gnawing," "burning," "misery," etc. As physicians, interpreters of physiology and pathology we must be alert to interpret accurately the patient's method of expression or we fail in our duty. One cannot be content with the bare complaint of pain. Pain has many aspects and, when completely recorded, correct deductions usually follow. It is, therefore, necessary to ascertain the character; its time of occurrence; its relation to food intake; its relation to position and to exercise; its mode of onset; any tendency to recur in attacks; its distribution as root, peripheral nerve, or a localized terminal ending; its radiation, and, finally, its mode of relief.

Pain from a hollow viscus attempting to empty is cramp-like in character. An inflammatory area gives a throbbing pain. An irritation of a nerve ending as in an ulcer, a pleurisy, or a traumatic wound as a rule gives a burning or knife-like pain. An irritation of a nerve along its course, as in a so-called neuralgia, or a prolonged abnormal pressure upon nerve-roots, gives either an "electric" or "shooting" pain, or a dull aching pain of varying degree. Thus the character of pain determines to a degree the location and cause.

Features, such as muscle spasm; impaired mobility of a part or parts of the body; disarrangement of physiologic func-

[1] The Radicular Syndrome in Hypertrophic Osteo-arthritis of the Spine, Lewis Gunther, Calif. and West. Med., xxix, September, 1928.

tions; loss or gain in body weight; loss of body strength, and laboratory procedures aid in arriving at a correct diagnosis.

There is a tendency to follow "short-cuts" and when examining one area of the body to forget that it is only a part of the whole. The abuse of incomplete study of a patient has led to the point where the diagnosis "chronic appendicitis" is considered as ridiculous, and where a prominent internist has said "there is no such condition." With the complaint of pain other parts of the body supplied by the same nerves have been frequently overlooked as the seat of the pathology.

This patient is presented as illustrative of the foregoing remarks. A male, forty-five years, who seven months ago, while in the act of lifting a bag of cement and turning, coincidentally, to the left—pivoting the body upon the pelvis and lower extremity—suffered a knife-like pain in the right lower lumbar region and subsequently a persisting, dull, low lumbar pain. He immediately consulted a physician, who strapped the low lumbar and sacro-iliac regions with adhesive. The pain, however, persisted and was noted by the patient to be quite marked in the right inguinal region. The physician in attendance was, therefore, so impressed that he operated for a right inguinal hernia, but found no unusual condition other than an early peritoneal bulge at the internal inguinal ring. The pain persisted, is still present, and now, after seven months, the attending physician is planning to operate for a "nerve caught in a suture."

The pain is of a dull, aching character, increased to a sharp knife-like type at times, by any motion of the lumbar spine, lifting, straining at stool, or by a sudden jar. It was striking to note while descending in an elevator the severe radicular pain caused the patient by the sudden stop of the car at each floor. The distribution of the pain, as volunteered by the patient, was exactly as illustrated in Fig. 569. A great relief is obtained by reclining on a mattress spread upon the floor or, as you see, by standing with his back against the wall. You observe that he walks with his vertebral column held rigidly, slightly inclined forward, and with a shortened right step. He rises and sits with

great care. All lumbar spine movements are limited to 10 per cent. of normal. Hyperflexion and extension of the right thigh increases the pain.

There is a band-like area of increased sensibility to pain and light touch stimuli over the skin supplied by the tenth dorsal to the second lumbar roots as illustrated in Fig. 569. The right testicle and spermatic cord were sensitive to pressure and it is of interest to note that they are also supplied by the same in-

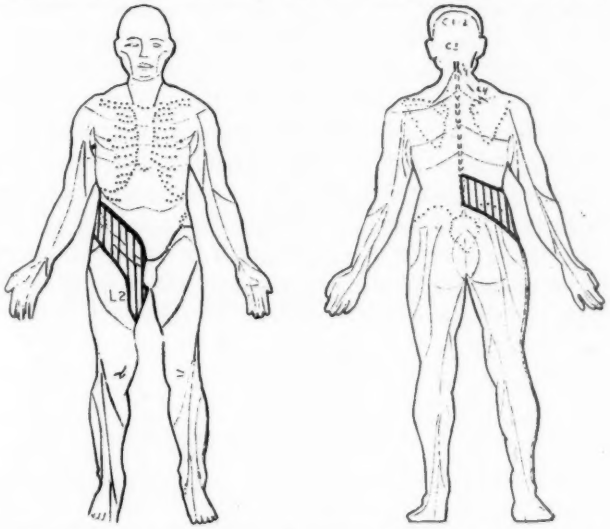

Fig. 569.—Radicular distribution of subjective pain and area of cutaneous hyperalgesia, involving tenth dorsal to second lumbar roots.

volved dorsal roots. You observe the flattening of the normal lumbar ventral curve, and the tenderness present over the lumbar vertebræ on the right, most marked at the third and fourth. The remainder of the physical examination is quite normal. The Roentgen ray examination shows "marked hypertrophic changes on the upper four lumbar vertebræ, with slight rotation of the body of the third to the left. Oblique fracture of the left lamina of the fourth lumbar vertebra, extending into the articular process."

The therapeutic test, a jacket for immobilization of the lumbar spine, has given the patient the first comfort he has had since the accident.

This patient has had then an irritation to the posterior roots of the tenth dorsal to the second lumbar nerves, resulting in pain distributed along the course of these same nerves. All because the character and other attributes of the pain were not fully evaluated this patient was subjected unnecessarily to a hernioplasty and preparation for another surgical procedure is in progress. There are many patients who consult us with equally as definite abdominal complaints, but with the pathology located in the posterior roots. Radiculitis such as this patient has, and characterized by pain influenced by movement of the vertebral column, or by other mechanical factors, such as lifting, jarring, straining, coughing, or sneezing, is frequently overlooked. A complete clinical history containing all aspects of the pain, and a complete physical examination, to rule out any lesions that might simulate the abdominal complaint, are of maximum importance and will save us from errors of commission and prevent errors of omission.

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